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COMPRISING FULL INFORMATION

ON THE

CULTIVATION,

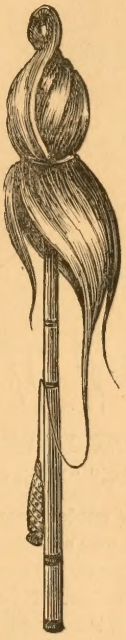
MANAGEMENT,

AND

MARKETING

OF THE

CROP.



TOGETHER WITH A COMPLETE GLOSSARY AND INDEX.

By Practical Flax Growers in the United States, Ireland, and Germany.

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Gardening for Young and Old.

——THE——

CULTIVATION OF GARDEN VEGETABLES in the FARM GARDEN

By JOSEPH HARRIS, M.S.,

Author of "Walks and Talks on the Farm," "Harris on the Pig," "Talks on Manures," etc.

The object of this work is to show how garden crops may be grown in field culture, and the teachings of Mr. Harris are mainly from his own experience, presented in that familiar style so well known to those who have read his other writings. We are sure that the work will be welcomed by a large class who are concerned over the problem, "How to make the farm pay." If his work is properly studied and its teachings followed, it cannot fail to be of great service, especially to the coming generation of young farmers, and may have much to do in "keeping boys on the farm." A small share of the work is devoted to the easily grown flowers, which will add to its value in the estimation of the mothers and sisters as well as of the boys.

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Introduction.—An Old and a New Garden.—Gardening for Boys.—How to Begin.—Preparing the Soil.—Killing the Weeds.—About High Farming.—Competition in Crops.—The Manure Question.—The Implements Needed.—Starting Plants in the House or in the Hot-bed.—The Window-box.—Making the Hot-bed.—Cold Frames.—Insects.—The Use of Poisons.—The Care of Poisons.—The Cultivation of Vegetables in the Farm-Garden.—The Cultivation of Flowers.

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FLAX CULTURE.

FLAX AND FLAX MACHINERY.

No country can be regarded as really independent of other countries unless it produces not only all the food, but all the clothing material it consumes. So far as cotton and wool are concerned, we produce an abundance, but for flax and the fabrics made from it we are largely dependent upon others. Three agricultural products seem to make very slow progress in this country: sugar from beets, oils, such as rape, colza, etc., and flax and similar fibres. One reason why these have not become important products of our agriculture is, because the farmer cannot convert the raw material into a salable product, as this either requires expensive machinery and skilled labor to use it, or the processes by hand are slow, and, of course, costly. If the farmer is to be expected to produce the raw material only, he must be assured of a market before he will undertake its culture. Capitalists are not ready to establishfactories until sure of a supply of raw material, and it takes a long time to establish the proper relations between the two—the farmer and the manufacturer. In the case of sugar, good progress has been made within a few years, and it looks as though we might, within a short time, cease to import sugar. In the matter of oils, our wonderful stores of petroleum, and the improvements in utilizing the heretofore almost wasted cotton-seeds, make it little necessary for us to seek any other sources of oils for burning, soap-making, etc.

Fig. 1.—FLOWER OF FLAX.

The native country of flax is unknown, though there are good reasons for supposing it to be in the Caucasus. The ancient use of the fibres is shown by the facts that the Egyptian mummies are enveloped in linen fabrics, and that paintings of the plant are found in Egyptian catacombs. The botanical name is *Linum usitatissimum*. The generic name, *Linum*, is the Latin name of the plant, which in Greek is *Linon*, in German *Lein*, in French *Lin*, and in Celtic, *Llin*. From these are derived our word linen, as well as lint, linseed and line. The specific name, *usitatissimum*, means most useful, and was given to it in reference to the service the fibre has rendered in furnishing clothing to the human family in all ages. Flax is alluded to in Genesis, XLI, 42, where it is stated that: "Pharoah took off his ring from his hand and put it upon Joseph's hand and arrayed him in vestures of *fine linen*," and frequent reference is made to both flax and linen in other portions of the Scriptures.

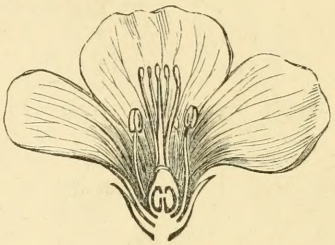


Fig. 2.—FLOWER CUT OPEN.

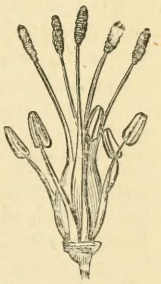


Fig. 3.—STAMENS AND PISTIL.

Flax is an annual, growing, when wild, eighteen inches high, though in good soil it becomes much taller. The stem branches more or less, according to the degree to which it is crowded by the other plants, as is illustrated in the first essay. The leaves are alternate,

linear-lanceolate, and with the stem, smooth. The flowers, arranged in a loose panicle, are about an inch in diameter. The parts of the flower are very regular and are all in fives. Fig. 1, shows a flower of the natural size and the same flower cut lengthwise through the centre is represented in fig. 2. The calyx consists of five green sepals; the petals are large, of a fine purplish blue color, and fall very soon after the flower opens. Within the petals are five stamens which surround the pistil, which consists of an ovary and five separate styles. Figure 3 shows the pistil surrounded by the stamens, and fig. 4 gives the pistil by itself with a stamen by its side, the figures being in both cases much enlarged. The ovary, or lower part of the pistil in ripening becomes the seed vessel, or boll. As it matures, the styles fall away, leaving their remains as a little point at the top of the boll, as in the left-hand engraving of fig. 5, where a seed vessel is shown with the remains of the calyx attached. When the young ovary is cut through at flowering time it only shows five cells or divisions, with two ovules in each; as the ovules mature to become seeds, a partition is formed through each of these cells or divisions, so that the ripe boll when cut open appears ten-celled, with a seed in each cell, as seen in the right-hand of fig. 5. The seed is too well known to require a description. Its skin is smooth and polished, being covered with a kind of mucilage which is readily soluble in hot water. This mucilage, dissolved in hot water, is popularly used under the name of "flax seed tea" as a bland and soothing drink in various inflammatory diseases. The seeds contain a large amount of oil, and the plant is often cultivated for this product alone. By cold expression they yield 18 to 20 per cent., and by the aid of heat, 22 to 27 per cent of oil is obtained. The seeds are usually roasted before they are pressed, as the yield of oil is greater and it is much freer from mucilage than that obtained by pressing the seeds without heat. The most powerful hydraulic presses are used in expressing the oil from flax seed; and the product, linseed oil, is largely employed in painting. When exposed to the air it gradually thickens and finally dries into hard transparent varnish. This drying property, which adapts it to its use in painting, is due to the absorption of oxygen from the air, and its tendency to do this is much increased by boiling it with litharge and other substances. The oil, just as it comes from the press, is known in commerce as "raw oil," while the other is called "boiled oil." The cake left in the press after the oil has been extracted is known as oil cake, and is much used as a food for cattle.

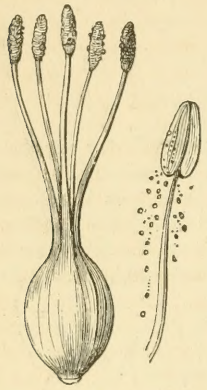


Fig. 4.—PISTIL WITH STAMEN.

It is however the fibre which gives the flax plant its greatest value. A stem of the plant being cut across, we find the centre occupied by pith, outside of this is a layer of ordinary woody fibres, then the *liber* or inner bark,

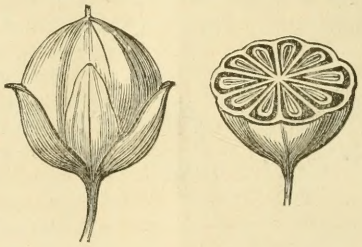
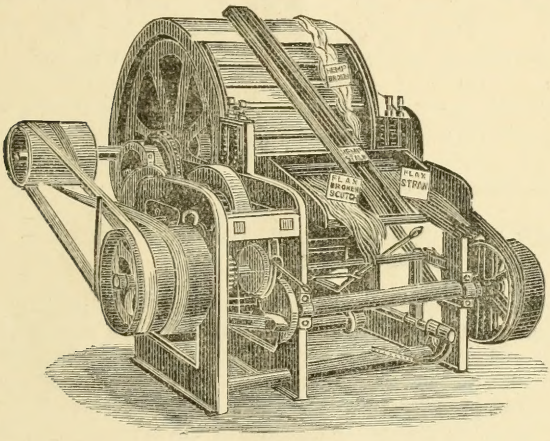


Fig. 5.—BOLLS OF FLAX.

which consists of very long and remarkably tough fibres, and outside of all an outer bark covered by a skin or epidermis. The object of all the processes of rotting, breaking, scutching, etc., is to separate the fibres of the liber, or inner bark, from all the other portions. The fibre of the flax is very tough, and has sufficient inequality of surface to adapt it to spinning. Being a good conductor of heat, compared with cotton, wool and silk, linen clothing is proverbially cool.

IMPROVEMENTS IN FLAX BREAKING.

With flax and other fibres, one great obstacle to their profitable culture has been the slow processes of bringing them into marketable condition, which, at our prices of labor, made the raw material too costly. Every invention that tends to diminish this labor is of the greatest importance to the agriculture of the country. The engraving shows the general appearance of an improved flax machine, which is very compact, taking up no more room than an ordinary grain fanning mill. The bunch of flax being spread upon the table in front of the machine, the stalks are caught in a set of grooved rollers; these by their peculiar motion cause the breaking, when the flax passes on to the scutchers, placed in the elevated part of the machine; after being subjected to their action for a short time, depending upon its condition, the flax comes back, is turned, and



FLAX MACHINE.

the other end is submitted to the same operation. All of this takes but a very little time, and at the last motion the workman has the flax in hand, beautifully clean and shining, with not a fibre tangled or displaced. The operation is as thorough as it is rapid, a careful examination failing to discover any appreciable amount of boon remaining to be removed by the hackle. One of these machines in each flax-growing township would make a vast difference to the profits of the farmers. To those who now raise flax for the seed, the machine will be of the greatest value, as by proper care in handling they may get a crop of fibre as well as one of seed. If seed is to be saved, the flax is harvested when the stem has lost its green color for two-thirds of its length; it is made into small bundles, and the few inches of the seed-bearing portion of the tops cut off with a hay or straw cutter having a single lever-knife; the stalks are then ready for rotting in the usual manner. We so thoroughly believe in a diversified agriculture that we gladly welcome any improvement that will allow our farmers to add another to the crops which they may grow with profit, and think it will be well for those who have land suited to flax, to consider whether they might not find it to their interest to undertake its culture.

The reaping machine was not complete until it was supplemented by an automatic binder, and this in turn increased the consumption of wire for binding the sheaves. But farmers have discovered that while wire answers to bind the grain, its use is undesirable for various reasons, mainly because it is dangerous. The unavoidable scattering of bits of wire about the farm, and the almost inevitable mingling of fragments of wire with the straw from the thrashing-machine, have already caused so many deaths of animals even while comparatively few binders are in use, that the fear of this threatens to stand in the way of the rapid introduction of these important adjuncts to the reaper. The general demand is now for an automatic binder that uses twine. The farmer has looked to the inventors for such a binder, and the demand has been met. They have supplied the binder, but who will supply the material for binding? Here the inventor turns again to the farmer, and says in effect—"We have given you what you have asked for—we cannot make vegetable fibres, those are in your line—you must grow the flax or hemp." Other materials will make a serviceable binding cord. Cotton cord may be used, but it is too expensive; Manilla or Sisal Hemp will answer, but they are mainly imported; they might be grown in the extreme Southern States, but, being new cultures, almost, it would take a long time to establish them. Hemp is a good material for cordage, but its production is very limited. So, upon a full survey of all the sources of fibre suitable for making binding-cord, the makers of the machines look to flax, not only as the best material, but one the culture of which presents no special difficulties, or requirements of climate, but which almost any farm in good tillage can supply. For this purpose the land and method of culture need not be such as are demanded to produce the finest fibre, such as

is required for thread and linen, as a coarse material will answer for binding-twine. It would appear that this new demand for flax, by the binding machines, is likely to influence and give a new impetus to its cultivation.

Flax grown for seed does not need the high culture required by that for choice fibre; any good grain land, or a turned sod, will give a fair crop. There are no special difficulties attending the culture. If the fibre is to be saved as well as the seed, the flax is harvested when the stem has lost its green color for two-thirds of its length, and made into small bundles. The top, or seed-bearing portion, is cut off with a hay-cutter having a single lever knife, to remove that portion at a clip, and the stalks rotted in the usual manner—either by steeping or by dew-rotting. Up to this point all is done by the farmer without any unusual machinery or appliances. The next step is the separation of the fibre for sale, and in this day of dear labor, hand-breaking and scutching will not be thought of.

Just here is where the farmer who would raise flax, meets with his first obstacle. He must have a machine, and it is beyond his means. What can he do with his flax? If several farmers, especially if one has water-power, or steam-power, can club together and purchase a brake, or if they can induce some manufacturer in the vicinity to establish one, and break at a fair price, the difficulty can be removed.

The cordage makers will not buy the flax unbroken, nor would it pay to transport such a bulky article to a great distance. The case is one that calls for a co-operation of producer and manufacturer. Those farmers who are able to become manufacturers so far as to prepare their own and their neighbors' flax for market, will be likely to find it profitable.

The makers of reaping machines, with binders, feel, very properly, that the success of their machines depends upon the ability of those who use them to readily procure a sufficient quantity of suitable cord at fair prices. One company has the matter so much at heart that it has sent out a circular to show just what kind of cord is needed, and how it should be balled and packed. The cord should be 3-ply or 4-ply; should not run less than 600 nor more than 700 feet to the pound, and be able to withstand a strain of 80 pounds; one meeting this description will answer for use in any of the successful binders now made.

FIRST PRIZE ESSAY.*—BY S. EDWARDS TODD,

OF AUBURN, N. Y.—(NOW OF NEW-YORK CITY.)

The subject of flax culture may be properly considered under three parts: 1st, The preparation of the soil; 2nd, The seed, the growth and culture of the plant and harvesting; 3d, The rotting and dressing for market. The first two belong particularly to the tiller of the soil; while the third is more properly a process of manufacture. Though very distinct from each other, the three processes are frequently performed by the farmer. Flax is grown sometimes for the seed only, and sometimes for both seed and lint. The seed yields a drying oil of the best quality for painters' purposes—the residue being oil cake, used for feeding stock; and the straw yields lint of two qualities, called flax and tow. Flax is the long, straight fibre, and tow consists of the short and tangled fibre, which separates in dressing the long lint. Sometimes, however, the entire fibre is prepared as tow. The lint that is separated from the long fibre, when the flax is dressed, is called in market, "fine tow"; it is manufactured into tow-cloth, or into small ropes and cords. The flax is made into linen thread, and linen cloth. "Coarse tow" consists of the entire fibre of flax, the shives having been simply removed. This is pressed into bales, weighing 300 to 400 pounds each, and is sold in most of our large cities, at 2 to 6 or more cents per pound, according to the locality and the demand, for stuffing the cushions and backs of carriages, and household furniture, for making ropes, coarse cloth, etc. There is always a good demand for flax fibre, whether it is in the long-line commonly called "flax," or fine tow, or coarse tow. Consequently, a farmer can always dispose of his crop of lint with a little labor, at low prices; or he can bestow much labor in preparing it for market, and receive a proportionately larger compensation. This is one of the excellences of the flax crop, and for this reason there is no other crop that may be raised in our grain-growing regions—where a three, four, or five-years rotation of crops has been adopted—with more profit to the farmer, and more advantage to the soil. If a farmer desires to raise it for seed only and get quick returns, it can be done with a limited amount of

* Written in response to Prizes offered by the *American Agriculturist*.

labor; but if he desires to have work for his laborers at those seasons of the year when nothing can be done in the field, he will always find it profitable, if he is a good manager, to grow a crop, and prepare the fibre for market.

Characteristics of the Plant.—Flax has one very important characteristic, an understanding of which is of great practical advantage. When a flax stem is growing alone, it will throw out numerous branches, many of which will be as large as the main stem; as shown by the accompanying engraving, (fig. 6;) and each of these will produce other branches, all of which will yield seed. On the contrary, when sown thickly, each plant will produce only a straight stem, without any branches, and mature but little seed. The practical point is, to decide before the seed is sowed, whether the purpose be to raise flax for the seed chiefly, with coarse tow in connection, or principally for the fibre. See paragraph upon thick and thin seeding.

Soils.—Flax will flourish well on any soil that will yield good crops of cereal grain, and some soils that do not produce abundant crops of certain kinds of grain, will produce an excellent crop of flax. Flax likes a deep, fertile, and mellow loam, and on such a soil a heavy crop of both seed and lint may be produced, provided there be not an excess of water in the soil. Those river bottoms, and uplands, where the predominating characteristic of the soil is black muck, if fertile enough to produce heavy grass, will yield a good crop of flax fibre, and a small crop of seed. But, if the soil is in a good state of fertility for yielding potatoes, oats, Indian corn, or rye, the yield of both seed and fibre will be large. Flax will not flourish on wet soils of any kind, and the crop will be light on heavy, slippery clay soils, unless thoroughly underdrained, well pulverized, and enriched with fertilizing materials. A good crop of flax can not be produced on a poor, wet, and half-pulverized soil, any more than can a good crop of wheat.

Preparing the Soil.—There is no kind of grain—wheat not excepted—for which the soil needs as much preparation as is required for a good crop of flax, and there is no crop that farmers are accustomed to raise, that will pay better for fertilizing and pulverizing the soil. Not only will the seed be better, but the fibre also, when the flax is grown on soil that is very fertile, and has been kept clean by thorough cultivation. Weeds and grass are not only a nuisance when the fibre comes to be rotted and dressed, but will seriously injure its growth, and if the dressed lint, the tow, or the flax, have grass, straw, or weeds in it, the value will be greatly reduced. My own practice in getting the soil ready for a crop of flax has been, to commence its preparation at least three years before, with especial reference to flax. I have always raised it in rotation, with Indian corn, barley, oats, winter or spring wheat, and red clover. A clover sod,

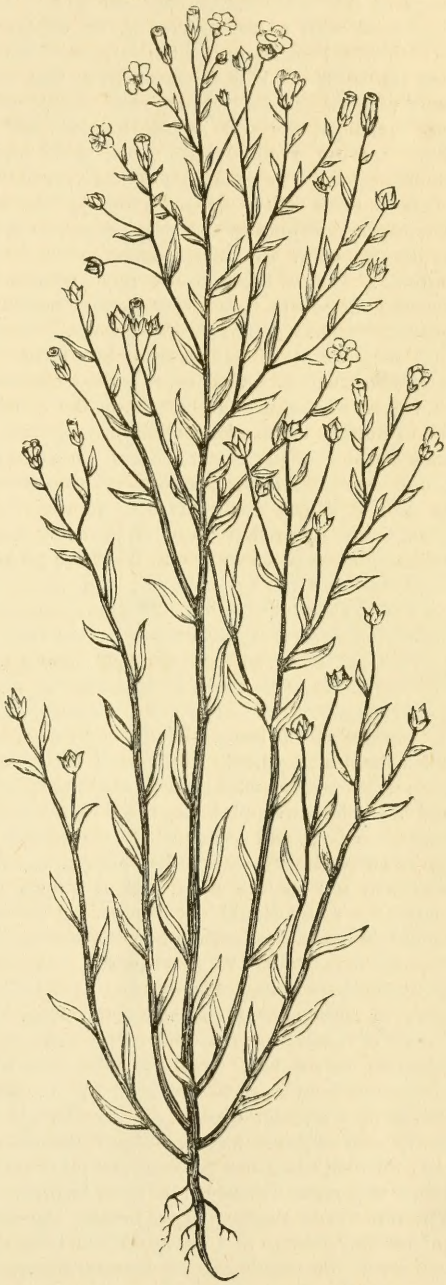


Fig. 6.—Flax plant growing alone.

well manured, is first plowed for Indian corn. If the soil is a heavy, slippery clay, or a gravelly, calcareous clay, it is plowed in the fall. If there

are any wet places in the field, they at least should always be underdrained. The corn is kept clean, and no weeds allowed to go to seed. The next year a crop of barley is raised, and as soon as the barley is harvested, the soil is well harrowed with a heavy harrow, or cultivated with a wheel cultivator, for the purpose of covering the seeds of all noxious weeds, so that they may vegetate and die before winter. In October, or November, the soil is well plowed; and if deep, we use a double team, and a Michigan double plow. The dead furrows are cleaned out, so as to carry off the surface water. If the soil were light and porous, and not disposed to bake in the summer, we would never plow it in autumn. Where black muck predominates in the soil, or where it is a very porous, sandy, or gravelly loam, or a light alluvial deposit, it should not be plowed in late autumn, but rather in August or September. Then, if any weeds come up before winter, use the harrow, or the cultivator to destroy them. In the following spring, as soon as the ground has settled and become sufficiently dry, plow it, cutting narrow furrow slices, as deep as it has previously been plowed; and always take especial pains not to have any balks or holes between the furrows. After the ground is plowed, we harrow it twice, and then roll previous to sowing the seed. The great object in harrowing and rolling before sowing the seed, is to have the surface of the ground as smooth and uniform as it can be made, so that the flax may get an even start, and grow more uniformly, and the surface of the ground be better to work on when the flax is pulled. If the seed is sown on an uneven surface, where there are lumps, sods, and little furrows and holes, much of it will be buried too deep, and consequently, the growth of the straw (and fibre) will not be uniform, and the seed will not mature alike. If there are no lumps, the roller should not be used, but the soil should be gone over with a harrow having numerous small teeth. Where the soil has been cultivated as it should be, while a crop of Indian corn, or barley, or potatoes was growing, the surface of it will be as free from lumps as a neatly prepared carrot bed. On such soils, flax will often grow from three to four feet long; the seed will be of a superior quality, and the lint will be heavy and of great length. Where the soil is well adapted to raising potatoes and other roots, if it is well manured about two years beforehand, and the weeds thoroughly eradicated, the proprietor may be sure of a heavy crop of both lint and seed. Thoroughly rotted manure is quite as essential for flax, as it is for wheat; but, coarse unfermented manure produces a rank growth of straw, not much seed, and the flax is very liable to rust. When there are many stones in the soil, the larger ones should be removed, and the smaller ones pressed down with a heavy roller before the seed is sowed, for the purpose of making a smooth surface to work upon at harvest time. In some portions of the country, a black muck soil rests directly on a stratum of rich, clayey loam. Now, by using a double team and a Michigan sod plow, or any other plow turning a deep furrow well, and by turning up two or three inches in depth of this fertile subsoil in late autumn or winter, so that the rains and frosts will thoroughly pulverize it before the next spring, then plowing and harrowing as just directed, a very heavy crop of lint, and a fair crop of seed may be raised. But it must be kept in mind, that a large crop of seed can not be raised on an inferior soil, without good manure of some kind. Clean culture, a deep soil thoroughly pulverized, and in a good state of fertility, will always produce a good crop of both lint and seed, if the season is at all favorable for other crops. Flax will do as well as oats, barley, or wheat, when sowed on sod ground.

Eradicating Small Weeds Before Sowing.—After the soil has been well prepared for the seed, let it remain about ten days, when nearly all the seeds of noxious weeds will have vegetated. Now, on the day that the seed is to be sowed, give it a thorough harrowing, for the purpose of destroying the little weeds that have appeared in the "seed-leaf." If many lumps of earth, or small stones are harrowed up, the surface must be rolled. And while the surface is fresh, let the seed be put in as speedily as possible, because flax seed, or any other seed, will germinate much sooner thus, than if put into soil that has not been disturbed for a number of days.

Proper Selection of Seed.—Most farmers appear to think that flax seed is all of one quality, so far as its productiveness is concerned. There is just as much difference in the productive quality of flax seed as there is in Indian corn; and a large proportion of that which is sold in market is no more fit for seed, and no more productive than Indian corn would be, were all the half-ripe ears shelled with the good ones for seed. No good farmer would ever think of planting such corn, because, although it might vegetate, it would not and could not produce a good yield of grain. So half-matured flax seed can not produce a good crop of either lint or seed. But unless farmers raise their own seed they will be obliged to take up with such as they are able to find in the market, whether good or poor. My own practice has been to obtain the plumpest and brightest seed to be found. Then run it through the fanning mill twice; and blow out all the light seed, by a heavy blast. Then, at harvest time, select those stooks of flax that grew on the

best ground and that ripened first, and keep them separate from the rest. Thresh off only about *half* of the seed, and save it for sowing the next season. Continue this practice for a few years, and even on the same soil, with the same cultivation, both the quality and quantity of the seed will be greatly improved, and the length and excellence of the fibre very much increased. The seed first matured—which will be the plumpest, fairest and most productive—will be shelled out first. Every intelligent farmer will readily perceive the importance of growing his own flax seed when it can be done with so little trouble and expense.

Thick and Thin Seeding.—Flax may be sowed too thick as well as too thin. The correct quantity depends upon the object for which the flax is raised. If we desire to obtain the largest yield of *lint*, we must sow the seed very evenly, and as thinly on the ground as it will grow and not throw out branches; as shown in fig. 6, but have the branchless habit exhibited in fig. 7. If the object is simply to raise *seed* and coarse tow, it may be sowed very thin—say from half a bushel to one bushel per acre. The old rule is, half a bushel per acre, but in my experience half a bushel is not enough, because, when it stands so thin on the ground new branches and new bolls will continue to grow, and when much of the seed is ripe, many bolls will be only half ripe. And besides this, the fibre of such large branched flax will not make as good lint as the longer less branched stalks. It may be worked into coarse tow; but it is not so good for dressed lint as the straight stalks. There is also a difference in the lint of the single stalks. If the flax seed be sowed at the rate of three or four bushels per acre, the stalks will be very small, and the fibre fine and thin, and very soft. But if only one bushel and-a-half be sowed per acre—if it be sowed as evenly as it should be—all the stems will be of a very uniform quality; the bolls will grow for the most part near the very top of the stalks; and consequently the seed will ripen more evenly, and the crop will be better in every respect than if thicker or thinner. The habit of flax is such that it will accommodate itself to the fertility of the soil better than most other plants, when the quantity of seed per acre is too small. If the soil is in a very good state of fertility, and one bushel of seed be sowed evenly on an acre, almost every stem of flax will throw out only two or three branches close to the ground. When flax forms branches we have the assurance that the seed ought to have been sowed a little thicker in those places. But when no branches are formed near the roots, it is a sign that there was as much seed sowed per acre as could grow profitably; and if the stalks appear small and slender, we need no better evidence that the seed was sowed too thickly. My own practice has been to sow about 1½ bushels of seed per acre, whether the chief object was *seed* or *lint*. I have always found that this amount of seed would give a better yield of seed and lint than any other quantity per acre.

Fig. 7.—THICK SEEDING.

Testing the Seed.—Many dealers in flax seed will contend that, as flax seed contains so much oil, it will not loose its vitality in many years. But my long experience justifies me in stating that it will sometimes loose its vitality in only a few years. Several years ago, I procured a two bushel sack of Russian flax seed, at a large price, and not a single seed germinated, although the soil was well prepared before it was sowed, and the seed was put in when the surface was fresh and mellow, and the seed possessed all the external appearances of the best. It was of a lively, brownish color, very plump, and heavy, but its vitality was gone. To test seed, select a few grains and sprinkle them between 2 thin pieces of sod laid earth sides together, and put them on a shelf in the kitchen where they must be kept warm and not allowed to dry. In a few days every seed that has not lost its vitality, will germinate. Then by counting them, we readily ascertain about what proportion of them is good.

When to Sow.—Almost all writers recom-

mend putting in the seed as early in the season as practicable. But my experience and extensive observation warrant me in saying that flax seed is almost always sowed too early. A certain season of the year that would be considered early in one locality, might be very late, one or two hundred miles distant in either direction. Therefore, to fix a definite period for every locality, I would say: Sow when the soil has settled, and is warmed by the influence of the sun, and weeds and grass have begun to spring up, and the leaves of trees begin to unfold. If sowed too early in the season, much of it is liable to be stunted; late frosts are very apt to injure it, more or less; and noxious weeds are sure to get the start of it, unless extra pains have been taken to destroy them. The soil should not be at all adhesive or sticky when the seed is sown. The very best time, with reference to the condition of the soil, is, soon after a shower, when the small lumps will crumble at a very slight touch, and the entire surface is friable and "lively." Then it will germinate in a few days, get the start of weeds, and *keep* the ascendency through the season. By this means much weeding will be saved, the fibre be more abundant, the seed better, and the yield greater.

How to Sow Flax.—Every practical man knows that flax seed is very slippery grain to sow by hand. Consequently, unless a man take great care, the seed will be sowed very unevenly. As it is so very slippery, it is not practicable to sow it with a grain drill, nor with any kind of broadcast seed sower, that we have ever met with. The details of my own practice, which I have never before put on paper, are as follows: After the soil has been harrowed as directed above, mark out the ground two ways, in lands about 18 feet wide. This breadth is wide enough to sow at one round, or two casts. Let the seed be soaked in warm water, about two or three hours, and then rolled in plaster or gypsum. Then make calculation to sow the required quantity of seed on each land, each way. Take as much seed as you can hold conveniently with one thumb and three fingers. If you are liable to take too much seed, hold a small round stone in the hand while sowing. The object of rolling the seed in gypsum is, to render it less slippery. I can always scatter the seed much more evenly by sowing a few rods wide all one way, instead of going directly back and forth. This I do, by going around a land about five or six rods in width, as in plowing. The best way to mark out flax ground is, to drag a log chain behind you across the field, from one stake to another. It will pay well to carry out all these practical details in full. As flax seed is much more difficult to sow than most other kinds of seed, it is very important that none but an experienced sower—one able to move with a very steady and uniform gait, and to cast every handful with the accuracy of machinery—should be employed to sow flax seed. If the ground be marked out, the sower can always see where his seed falls. But, when he sows by means of stakes, a deviation of only a few inches, to the right or left, will drop the seed too thin in some places, and too thick in others. The sower should always set a small stake where he commences to sow, at both ends of the plot, so that he will be sure that no strip will anywhere be sowed too thick or too thin.

How to Cover the Seed.—I never would allow a team of any kind to pass over the field, after the seed has been sowed, for the following reasons: If the soil is at all light and porous, a team will, with their feet, bury much of the seed so deeply that it will be several days behind, and never be able to attain an equal growth with the rest of the field. Another reason is, when the seed is buried so deep, the flax will pull much harder. Flax seed requires but little earth to cover it deep enough to vegetate in a short time, and by depositing it all on a smooth surface, where several seeds will not be gathered into depressions in the soil, it will all vegetate alike, will stand evenly on the ground, and pull easily, may be cut with scythes, cradles, or horse mowers, close to the ground, and the straw and lint will be of a uniform length, and quality. My practice has been to "bush in" the seed by drawing a brush-

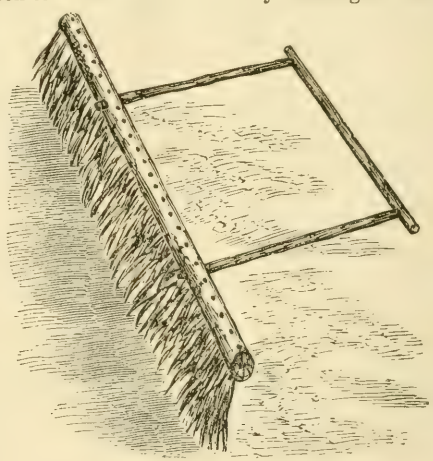


Fig. 8.—BRUSH-HARROW.

harrow by hand. With a suitable brush, one man can bush in four or five acres per day, and do the work well. Such a harrow covers a strip about five feet wide, and an active man or a strong boy can cover the seed nearly as fast as he could do it with a team, and much better.

To Make a Hand Brush-Harrow.—(Fig. 8.) Procure a piece of hard-wood scantling, or a

round stick, about five feet long, and three by four inches square, for the brush head; put two thills into it, and bore two sets of three-quarter inch holes through it, for receiving the but-ends of brush which are fastened in the holes with nails. Brush about two feet long should be selected, and after the holes are filled with them, another course may be nailed on each side of the brush-head, if necessary. This will be found a most complete implement for covering flax seed. The effectiveness of such a brush-harrow may be increased at pleasure, by lashing billets of wood to the upper side of it. The length of the head may be greater or less, according to the evenness, or the unevenness, of the surface of the soil. If it should be somewhat uneven, it would be better to make two such harrows, four feet long, for two men to use, than one harrow, eight feet long, to be drawn by two men, because a short one would adapt itself to the inequalities of the surface, and cover the seed much better than a long one.

The accompanying illustration (fig. 9) represents five young plants of flax, three of which are about three or four inches high, the seed of which was covered about half an inch deep. The seed of the one at the left hand was buried nearly two inches deep: and the one just in the seed-leaf was buried still deeper. The illustration is designed to show the importance of covering all the seed of a uniform depth, in order to have all the stalks as nearly of a uniform length as practicable. When some of the seed is buried too deeply, those plants that spring from such seed as may be covered only half an inch deep, will get the start of the other by several days' growth, which will produce stalks of various lengths. This ought to be carefully guarded against in putting in the seed. Moreover, when a flax seed germinates, the kernel is carried on the end of the stem to the surface of the ground, where it forms two leaves, as shown by the smallest plant. When seed vegetates in this manner, it is longer coming up than when only a spear is sent up, like Indian corn, wheat or oats. The difficulty is greater on heavy than on a light soil. And if flax seed be covered deep on a heavy soil, and the weather be somewhat dry, it will be impossible for it to come up, while oats or wheat would come up with no difficulty.

Weeding Flax.—If the soil has been prepared, and the seed put in at the time and in the manner directed in foregoing paragraphs, very little weeding will be required; but if Canada thistles, dock, wild mustard or other noxious weeds should show their heads, let a careful man, shod with two or three pairs of old woolen socks, remove them when the flax is eight or ten inches high. A lot of boys, or heedless men should never be allowed to go among flax, unless when it is very young; because if it is trodden down after it has grown a foot or more in height, most of it will never recover its erect position. The

Fig 9.—EFFECT OF DEEP AND SHALLOW SOWING.

object of covering the feet with something soft is, that the plants may be injured as little as possible. Hard boots and shoes will crush the stems so badly that even if they should straighten up again, there would be a bad spot in the fibre. The weeds should be *cut off* close to the surface of the ground, gathered in the arms, and carried to a pile—not thrown down. If pulled up, much of the flax will be rooted up with them. In some parts of the Old World, men, women, girls and boys do the weeding, when the flax is only a few inches high; they sit flat on the young flax, hitch along, and weed on each side of them as far as they can reach. It is better to destroy the weeds before the seed is sowed, and keep every thing off the young flax.

When to Pull (or Cut).—As the time of ripening approaches, the observing farmer will appreciate more than at any previous period, the importance of the details heretofore given. When the seed has been harrowed in and buried deep by the feet of teams, the flax will ripen very un-

evenly; and a portion of it will be very green, while the remainder will appear fully ripe. Under such circumstances it will be necessary to estimate what proportion of the heads are fully ripe, and how large a proportion are still too green to be pulled. When the bolls have assumed a brown color, and the leaves have died for one-fourth the length of the stems at the lower ends, and the stems themselves have changed from a dark green to a light yellowish color, then the flax is fit to pull or to cut. At this stage of growth, it will yield more and better fibre than if cut at any other period. If it is too green when pulled, there will be a great loss both in

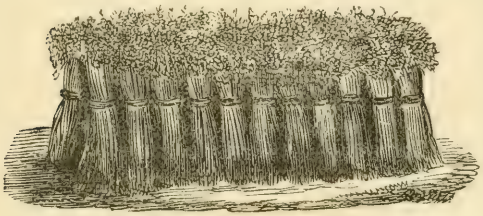


Fig. 10.—STOOK OF FLAX.

quantity and *quality*. If the seed be put in as directed, almost all the bolls and stems will ripen uniformly; and it will be very easy to decide as to the best time for pulling or cutting without incurring any loss. When a man has a number of acres of flax to be pulled, he should not wait until it is all ready before he commences, lest much of it become too ripe. Should the soil be variable in its character, the flax will ripen unevenly, and the ripest portions may be pulled first. When flax is allowed to stand until it is dead ripe, the seed will be of superior quality, but the fibre will not be so heavy, strong, or soft.

PULLING FLAX.—When flax is pulled by hand, each laborer takes a strip about four feet wide, and either spreads it in a swath behind him, or throws it down in gavels, or binds it himself, as fast as he pulls it. The flax is grasped just below the bolls, with both hands, and pulled up with a sudden jerk. If it be pulled slowly, a much larger quantity of earth will adhere. As soon as one handful is pulled, it is set on the ground close to the standing flax, and held with one hand, while the other gathers as much as can be held conveniently: then both hands grasp the whole and pull. When enough has been pulled to make a gavel as large as the puller can grasp with both hands, which will make a bundle about five inches in diameter, it is "butted" once or twice on the ground, to even it. Any scattering stalks standing or lying on the ground, are gathered for bands, and the gavels are bound at once. This mode is usually adopted in preference to spreading in swaths. If the weather be wet and lowery, it will be better, at any rate, to bind the flax as fast as pulled, and to set the gavels in long stooks, as shown in fig. 10. These should always be set up north and south, so that the sun may shine on both sides of the stook in the course of the day. Before the gavel leaves the hands of the puller, he should strike it once or twice on the ground, or on his foot, to knock off the dirt. If the weather is pleasant, it is always better to spread out each gavel, as it is pulled, about one inch thick, for the purpose of sunning it. After it has lain in the sun from half a day to a day, it ought to be turned over, to sun both sides. An expert puller will throw every gavel down in such a manner, that they may be readily gathered when cured enough to be bound up. As flax will hang together, if in a continuous swath, it is better to leave a space of two or three inches between the spread gavels, and sometimes they are laid alternately heads and buts. This is important, so that they may each be turned over readily, or taken up and bound, without tangling. When it is bound as soon as pulled, and set in stooks, it will require from one to two weeks to cure, before it will be fit to stack or mow. When it is bound as fast as it is pulled, the outside of the flax will, in a very few days, all appear sufficiently cured to be stacked, while much of the middle of the bundles will be too green. It is quite as important to cure all the stalks and seed bolls thoroughly, before stacking, as to cure hay, or any kind of grain. The question is frequently asked, why it is not as well to cut flax as to pull it? The fibres of flax diminish in size, tapering from a few inches above the root until they run entirely out at the root of the plant. It will therefore run much smoother when spun, and will form a cleaner and smoother thread if pulled than if the fibre is cut in two. If the stalks can be cut within an inch of the root, nearly the entire length of the fibre will be secured, as well as a part of the advantage of this tapering of the fibre. In some parts of our country, dealers make a difference in the price between "reaper-cut" and pulled flax.

PULLING WITH MACHINES.—Several different machines have been invented for pulling flax, which have done tolerably good work, when the ground was smooth, level, and so dry that but little earth adhered to the roots. Most of them injured the fibre more or less, and some could not be adjusted to pull short and long flax equally well, nor would they always deliver it evenly; and when much earth adhered to the roots, it would either obstruct the machinery, or too much hand labor is required to remove the dirt before it became dry. In some instances where the soil was prepared with much care and the seed put in as previously directed, the writer has seen flax pulled in a neat manner at the rate of

three to four acres per day, with two hands and two horses. But flax-pulling machines have only been introduced to a very limited extent as yet.

Cradling and Mowing Flax.—When the soil has been prepared, as previously directed, and the surface made very smooth, if the flax stands up well, an expert cradler will cut it very close to the ground, and lay it evenly in a swath. But I have always found that I could cut it closer with a scythe than with a cradle, do it with less fatigue, and at the same time lay it in a swath quite as evenly as it could be done with a cradle. The scythe must be placed flat on the ground, and both heel and point kept well down, not only when it is set in, but in pointing out. I was always accustomed to cut a swath about 7½ or 8 feet wide, and when pointing out to jerk the point of the scythe towards me, as soon as the last stalks were cut off. This motion of the scythe tended to straighten the under side of the swath, and by bringing the heel around just so far every time, and giving the scythe just a certain motion, I could always lay the flax as straight as if it had been pulled, and, if the ground was smooth, could shave it within an inch of the surface. The small amount of fibre that remained in the stubble would not be an equivalent for the greater expense incurred by pulling. When any of the flax has grown so large that it falls down, it can be cut with a scythe much better than with a cradle. If it is very long and heavy, when it is down it will be better to pull such plots, than to mow them. Let the swaths be turned over after they have been sunned sufficiently. In turning thrust a pole under the swath, and turn only enough at a time to make one bundle, keeping the divisions distinct. Whether the flax is pulled, cradled, or mowed, it is important to keep the buts as even as practicable before binding the gavels.

Assorting Flax.—When flax of various lengths is bound together, a large portion of the fibre of the short stalks will be separated from the long fibre, in the dressing, and be wasted in the tow. Furthermore, when the seed is threshed off, if the short stalks be bound up with long ones, many bolls will not be threshed, and all their seed will be lost. For these reasons, it is important that the long flax should not be bound in the same bundle with short flax. If pulled by hand, it will be very easily assorted, by pulling a handful of the long, and then one of the short, putting each in separate gavels. When it is mowed, or cradled, by taking a little pains, the short stalks may be laid, for the most part, in a swath by themselves, and the long ones in another swath. Long bundles and short ones need not be kept separate. It is only necessary to keep the long stalks and the short ones in separate gavels, in order to dress those of the same length together.

Manner of Stacking.—It is not always convenient to put flax in a barn, and it is important to keep it where hay seed, chaff, and straw will not be mingled with it, and where mice and rats will not work. The best way of stacking is, to make a long stack-bottom, by placing three poles, sticks of timber, or plank, side by side, from two to three feet apart, according to the length of the haulm, and one foot above the ground; and then lay two courses of sheaves, with the tops together, and with one course above another, as represented in fig. 11. As flax haulm will hang together so well, the ends of the stack may be carried up square, without any posts or stakes. In order to give the sheaves a good pitch, the heads of a few of the top courses may be laid on each other. Then cover it with

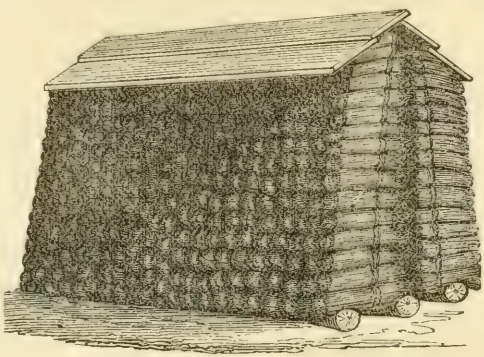


Fig. 11.—STACK OF FLAX.

canvass, or with boards, as represented in fig. 11. If barn room can be had, let all chaff and hay seed be swept away before the flax is hauled in.

Tangled Flax.—When flax is mowed by hand, or with a mower, and the stalks are not kept straight, it is called tangled flax. My own practice, which coincides with that of other farmers accustomed to raise flax, has been to cut it as close to the ground as possible, and cure it, rake it, cock it, and stack it, or put it in a mow, just as if it were hay. When it is mowed with scythes, let it remain about one day in the swath, and then turn it over. As soon as it appears sufficiently cured, rake it into bunches with hand or horse rakes. If the weather is favorable, let it remain in bunches about as large as a man can pitch at one forkful. When flax is managed in this way, we prefer to put it in the barn, in preference to stacking it. When it is stacked, however, the top of the stack should be built sloping, instead of pointed like a roof, and covered with sound boards, or with canvass, as a stack of tangled flax will not turn rain so well as hay. When the flax is to be cut with a reaper, and it is de-

sirable to keep the stalks straight, we put on the platform as for reaping grain, fork off the flax in gavels, and let them be set on the but-ends, as soon as cut, as illustrated by fig. 12, which represents a gavel of flax placed on the end. Sometimes the flax is so long and heavy that it will not be practicable to rake, or fork it off, while the reaper is in motion. In such a case, as soon as enough for a gavel has been cut, stop the machine, remove it with the hand, set it on the buts, and let another hand straighten it up. A little longer time will be required, if the reaper is stopped for every gavel, but the work will be done enough better to compensate for the extra care, and time will be gained in the end.

Fig. 12.—GAVEL.

THRESHING FLAX.—When flax is bound in small sheaves, we sometimes take a bundle in both hands and strike the heads on a large stone, or on a plow turned upside down on the barn floor. Sometimes the seed is threshed off with flails. If the sheaves are not too large, the best way is to whip it out on a large boulder. Strips of canvas, or blankets, should be hung up on three sides, to keep the seed from flying beyond the floor. When the seed is whipped out on a stone, all the loose seed will of necessity be separated from the haulm; but when it is threshed with flails, the sheaves require much shaking to separate the shelled seed. Moreover, flails will break the stalks, more or less, which works an injury to the fibre during the rotting process. When the seed is whipped out on a stone, the stalks will not be broken, and a man can thus whip out more seed than he can thresh with a flail. Another way is, to thresh with a common threshing machine. If the cylinder is what is called an "over-shot," raise the concave so that the ends of the spikes in the concave and in the cylinder will just meet, but not pass between each other. If the concave is beneath the cylinder, and can not be lowered, adjust the feeding table so that a bundle of flax may be thrust directly against the middle of the cylinder. This done, thrust the top of each bundle against the cylinder in motion, and be careful not to let it be snatched out of your hands. The bundles should not be held to the cylinder, after the bolls are removed, as the spikes would lacerate the fibre. Thrust the bundle against the cylinder, and withdraw it, turning it partly over, and give it another thrust, until all the bolls are removed. We never unbind our bundles of flax to thresh them with a machine.

Tangled flax is sometimes threshed with horses by treading it out, and sometimes it is run through a threshing machine, as oats and wheat are threshed. But the concave must be raised, or lowered, from the cylinder, as the case may be, so as to make as much space as possible between them, and still thresh clean. When the concave is not adjustable, some threshers take out half or two-thirds of the spikes in the cylinder. As flax seed will thresh very easily, it is not necessary to set the concave as close to the cylinder as to thresh cereal grain, and, furthermore, when it is set close to the cylinder the machine will not thresh one-half as fast. If the flax is long and damp, the machine must be fed with care, or it will wind up on the cylinder, and choke the machine, or damage the fibre.

RIPPLING.—Rippling and threshing are frequently used in America, as synonymous terms. In the Old World, the bolls are usually separated by rippling, which is done as soon as practicable after the flax is pulled, and before it has been allowed to cure. The flax is pulled while a portion of the seed is yet in the dough state, and the tops are drawn through a ripper, a coarse hatchel, or comb, with long, sharp-pointed iron teeth, which tear off all the bolls and chaff, whether green or matured, and the flax is hurried away to be rotted as soon as practicable, before it has been allowed to cure. The bolls, seed, and chaff are all spread out on a floor and dried, and mingled with oats or barley, and ground into meal for feed. This constitutes the difference between rippling and threshing. Both green and dry bolls may be separated from the haulm by rippling, but green ones can not be threshed.

ROTTING OR RETTING.—After the seed has been separated, the stalks are passed into the hands of the manufacturer, whose business it is to prepare the fibre for market by rotting and dressing it. If the producer desires to perform a portion of this labor himself, he should understand what to do and how to do the work. The stalk straw or haulm of flax consists of two parts—the fibre or inner bark, and the shives or woody interior portion, and which is also frequently called shoove, shove, boon, and hurl. The fibre adheres firmly to the stalk by means of a glutinous substance, and the object of rotting the stalks is to dissolve and decompose the mucilage which holds the fibre and the woody parts so firmly together; and when properly rotted, the shives will separate from the fibre as readily as bark will peel from a young willow sprout in early summer. There are two ways of rotting flax, preparatory to dressing it. One is called aerial rotting, and the other water rotting or steeping.

Aerial or Dew Rotting.—This is accomplished by spreading the flax on a smooth grass plot, in long straight swaths, about half an inch thick. A lad goes before the man who spreads

the flax and divides the bundles into handfuls, throwing them down where the swath is to be made. The spreader either bends his body forward, or squats down with the tops of the stalks toward him; and with a quick motion spreads the handfuls as fast as they can be thrown to him. There are only two things to be observed when spreading flax, which are, to keep the buts even, and to spread it of a uniform thickness. Some spread the swaths so closely that they touch each other, but I always prefer to leave a space of a few inches between, to prevent the tops of one being tangled with another. After it has lain a week or ten days, it should all be turned upside down, by running a long slim twenty-foot pole beneath the swath, near the top ends of the flax, and let a man and a boy turn over a section of about twenty feet at once. I have always found that two would perform this part of the work better than one could do it with a short pole, because every time a portion of a swath is raised, unless some one stands on the swath where the separation is to be made, it will be more or less tangled. The length of time required for rotting will depend entirely on the state of the weather. If alternate rains and sunshine prevail, two, three, or four weeks will be sufficient. The length of time that flax has been spread must never be relied on as a correct guide for determining whether or not it is rotted enough. There are certain rules which all experienced flax growers understand, which will enable a beginner to determine when it is sufficiently rotted. The most reliable rule is, the stalks, if bent with the fingers, when dry, will snap like pieces of glass, and the shives separate freely from the fibre. Beginners should watch their flax every day and apply this test, lest it be rotted too much, causing a great waste of good fibre. When rotted too much, the fibre will separate from the shives at the junction of the main stem and branches, and sometimes the fibre of the main stems will separate from the shive; and portions of the stem will be seen in the form of an Indian's bow, when adjusted for the arrow. It needs a little experience to determine the point at which flax is sufficiently rotted.

Steeping or Water Rotting.—The true way of rotting flax is to steep it in water. In dew rotting, if the weather be ever so favorable, a good proportion of it will be rotted too much if it be kept on the ground until all the stalks are rotted enough. But when steeped or water-rotted, there is greater uniformity in the process. If it is kept in the water just long enough, it will be all rotted alike, and be done very much better than it can possibly be by dew rotting. Moreover, flax can be rotted much sooner by steeping, than by dew rotting, the object being simply to dissolve the mucilage that holds the fibre and woody parts together, so that they will separate readily as soon as the flax has been dried. Prepare a pond of water in the same way as a mill pond, with a waste gate to let the water off at pleasure. A suitable place can be prepared on almost every farm at a trifling expense. The bundles are held in an erect position, a few inches from the ground, so that the water may pass both beneath and above them. For this purpose a platform may be made of rails or boards, and fastened down with stones or stakes. Then set up the bundles and drive down stakes, and nail strips of boards from one to the other, over the tops of the bundles, to keep them from rising out of the water, which covers the flax a few inches. Then shut the waste gate and let the pond fill. Sometimes a crate is made, and launched on a mill pond and the bundles secured in it, when it is floated into deep water and sunk sufficiently with stones placed on the crate. Soft rain water is superior to spring water for rotting. While it is in the water a partial fermentation commences, which must be arrested at the proper time, or the fibre will be damaged in proportion to the degree of fermentation beyond the proper state.

When to Remove from the Steep.—As the process of fermentation will progress very slowly in cool weather, and rapidly in warm, it is impossible to state any definite period of time for keeping it in the water. If the water be of the correct temperature, the process of rotting will be completed in six or seven days. The cooler the water the longer the flax will be in rotting. After it has been steeping about five days, it should be examined carefully every day, for the purpose of ascertaining when it is rotted just enough. Pull a few stalks from different bundles in several places, break them into pieces a few inches long, and pull out the shives. If they separate very freely from the fibre, the water

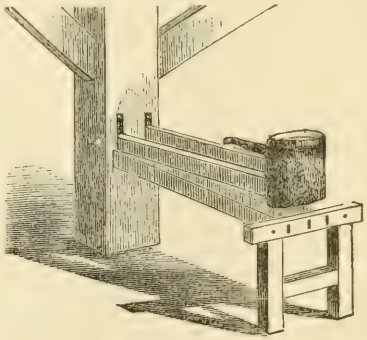


Fig. 13.—HAND-BRAKE.

should be let off without delay, and the flax spread out on clean grass to dry; when dry enough, it should be bound in large bundles and housed.

BREAKING.—*The Hand-Brake.*—Fig. 13 is a cheap hand-brake. The lower part consists of three slats of hard wood, 4 feet long, 5 inches wide, 1¼ inches thick, at one end fastened firmly into the post of a building, and the other ends mortised into a frame. The upper edges of each slat should be dressed to an edge. Two blades of the same form and size are bolted in long mortises in the post, as shown in fig. 13, and the outer ends of these slats are fixed in a block. Set the two upper slats opposite the spaces between the lower; and the edges of all, when shut together, should be on the same level. A wooden pin in

Fig. 14—GAVEL HOLDER.

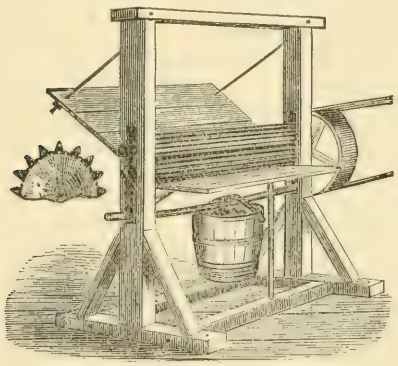


Fig. 15.—POWER BRAKE.

the head above the blades serves for a handle. The slats in brakes of this form are sometimes made to shut between one another, as a knife blade into its handle. This is a wrong construction, because when the edges of the slats pass between each other, they stretch and tear much of the fibre, and break out the shives no better. In using such a brake, crush a handful of straw between the slats, working the upper part up and down, moving the handful along, and turning it, until the shives are well broken from end to end.

For convenience in holding a handful during the process of breaking, make two sticks, (fig. 14,) about a foot long, and three-fourths of an inch diameter, and tie them together, about 15 inches apart, with a small cord. The cord is passed around the handful of flax, as shown by the dark line, and the two sticks are grasped with one hand. By this means one can hold the flax firmly, keeping it evener than with the hand alone.

The Power Brake.—Fig. 15 shows a cheap revolving brake, which is driven by horse, or water power. It consists of two fluted, or corrugated rollers between which the bunches of flax are passed repeatedly, until the stalks are broken so finely that the shives may be readily separated by shaking, and with the scutcher. The rollers are about two feet long, and six inches in diameter. The lower roller is stationary, and the bearings of the upper one play up and down in slots three inches long. This roller is held down to the other by iron rods, or strips of band iron, which pass over the gudgeons and support a stick, which holds a tub filled with stones. This weight can be increased at pleasure. A large driving pulley on the journal of the lower roller, gives a velocity of about one hundred revolutions per minute. The rollers may be made of cast iron, or of wood covered with iron ridges screwed firmly to its surface, as shown at *R*, fig. 15. A handful of flax is placed on the inclined feeding table, and a man catches it as the rollers bring it through toward him. He then places it again on the feeding table, and continues to run it through until it is thoroughly broken. After the flax is broken, the loose shives are shaken out, and the rest is worked out by scutching.

Fig. 16. SWINGLE.

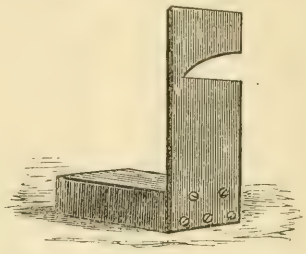


Fig. 17.—SCUTCHING BOARD.

SCUTCHING.—Figure 16 represents a hand scutcher, or swingling knife. It is of hard wood, 2 feet long, with two edges. The hand scutching board is about three feet long, and one foot wide, with a notch as shown in the cut, and fastened securely to a heavy block as shown in fig. 17. The length of the scutching board is regulated by the stature of the man who uses it. A handful of flax is grasped one side of the middle in one hand, and is held in the notch of the scutching board. The knife is then struck on it as if it were to be cut off on a line

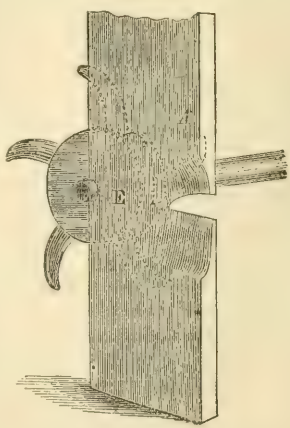


Fig. 18.—POWER SCUTCHER.

with the surface of the board. The handfuls are turned, and both ends scutched until the shives are removed. A *Revolving Power Scutcher* is shown in fig. 18. This consists of a wooden shaft, with a system of scutching knives set in it, like the spokes of a wheel. These knives have but one edge; and they must revolve as true as a mill stone. The shaft should make from 150 to 200 revolutions per minute close to a scutching board. If desired this shaft may be made long, with sets of scutching knives every four feet.

Hatcheling.—After the bunches have been well scutched, they are hatcheled. The teeth of a fine hatchel are about six inches long, one eighth of an inch in diameter at the large end, and taper to a sharp point. About 10 of these are set say 4 inch apart, in a hard board, and the fibre is drawn through them until it is sufficiently lacerated and combed. The handfuls are then twisted a little, and packed in a clean box for market. In some markets, however, hatcheled fibre will command no larger price than the unhatcheled, because the process of hatcheling is the business of the spinner, and requires skilled labor to do it properly. An inexperienced hatcheler will waste a large per centage of good fibre. For this reason, flax growers should aim simply to remove the shives or "boon," and leave the fibre as whole and long as possible, and let the spinner perform the hatcheling, unless dealers make a great difference in the price between the hatcheled and unhatcheled fibre.

SECOND PRIZE ESSAY.—BY JAMES CAIRNS,

BALLYDURANE, CLONOKITTY, COUNTY CORK, IRELAND.

An essay of so circumscribed limits as this, and yet on a subject embracing so many different processes as the flax crop must pass through, while in the hands of the farmer, each requiring the most minute description in detail, does not admit of many introductory remarks. I shall, therefore, not attempt any in the present instance, but, reserving the limited amount of space allotted to me, for absolutely necessary matter, address myself to my subject at once, and first, as to

Soil.—Flax is not, as some suppose, confined to a narrow range of soil. On the contrary, good crops may be grown on almost any soil that is new to it. The soil which by common consent is voted to be the best adapted to flax culture is a sound, dry, deep, friable loam; a soil of the greatest possible variety of ingredients. But while this is universally admitted to be the best, I have always found, in practice, that no soil whatever is capable of producing a better crop of flax, both as regards yield and quality, than a sharp gravelly clay, provided it is deep and dry. Taking the loam above described, however, as the standard soil, we may extend, on the one hand so far as midway between it and a heavy, retentive clay; and on the other hand, so far as midway between it and a light sandy soil, with every certainty of success so far as soil is concerned. These limits embrace a very wide range, and great variety of soils, all capable of producing, under proper treatment, superior crops of flax. Good crops may also be expected a considerable distance beyond these points, but as we approach very heavy retentive clay, or very light sand, our chances of success become less; and on the latter, flax culture should never be attempted. It will be easy for any man to say whether the particular soil which he has to deal with is suitable to the growth of flax or not. But whatever the soil may be, it should be borne in mind that it must either be naturally dry, or rendered so by thorough draining and subsoiling. These operations, where necessary, ought to take place at least two years previous to the introduction of a flax crop.

Rotation and Situation.—The place in the rotation which I consider most suitable for the flax crop is on oat stuble after rich old lea. I do not mean rich in applied manures, but in dead vegetable matter. I have also frequently grown it, very successfully, as a first crop on such lea; but when it is desirable that oats should occupy any place in the rotation at all, I much prefer preceeding the flax by oats, as by so doing the rich old lea sod—the very best manure for flax—has sufficient time to become completely decomposed, and its elements made available as food for the flax, and by the repeated plowings, etc., it must necessarily undergo, be thoroughly blended with the soil. In this way a much evener, better yielding, finer quality of flax, can be obtained than it is possible to produce under any other circumstances, or in any other place in the rotation, except by mere chance. The next best place is on wheat or barley stubble after green manuring; very good crops are sometimes grown in this place in the rotation, but the result is not so certain, and never so satisfactory; the crop being less uniform in length, coarser in quality, and rather more wasteful in cleaning. Flax should never be grown as a first crop after green manuring. My objection to this is the impossibility of mixing the manure applied to the preceeding crop, so thoroughly with the soil as the nature of the flax plant requires. The roots of the flax do not spread far in a lateral direction, but sink perpendicularly; the result is that plants sending their

roots down through lumps of undivided manure, get a start, and monopolizing the air and light, branch out and spread over their less fortunate neighbors. To a casual observer the crop may appear very good, as it generally has a very luxuriant appearance, but a man of experience will look to the great waste that is certain to ensue in the mill; for, as the scutcher holds the "streek" nearer to one end than the middle, a great deal of the shorter flax escapes his grasp, and finds its place among the tow. But if even this were not the case, the sample would be of unequal quality—some very coarse, and some fine, therefore, of less value to the spinner, and consequently to the grower. The same objections apply, with still greater force, to the application of farm-yard manure directly to the flax crop. The application of lime is also objectionable. When light poor soils, however, are the subject of treatment, a slight dressing of finely pulverised commercial manure, such as phosphatic or Peruvian guano, superphosphate of lime, etc., may be beneficially applied, if well harrowed in and incorporated with the finely pulverised soil. Keeping the foregoing observations in view, it is of little consequence what the other crops in the rotation may be; but as the flax plant delights in change of soil, I would not reccommend it to be grown oftener than once in a five-course rotation on the best soils; and according as we depart from the standard soil, before indicated, the intervals between the occurrence of flax crops, in the same land, should extend to six, eight, or ten years, according to gradation of soil. As to *situation*, the only places we have to guard against are high, bare, exposed situations, and the shade of trees. In the latter case the crop is apt to lodge or become rusty before it has put on fibre. The *aspect* does not matter much, but a southern, or south-eastern aspect is to be preferred, chiefly as it gives an opportunity of sowing earlier, and consequently of having the crop watered before the cold nights in autumn.

Preparation of the Soil.—This operation should, for the most part, take place in the autumn, shortly after the removal of the previous crop. If a proper system of farming, and deep clean cultiyation has been followed, the preparation of the soil for flax becomes as easy as for any other crop, in fact, land fitly prepared for a green crop is also fit for flax. In the case of oat stubble after lea, (which I greatly prefer) it should receive its first plowing in a diagonal direction across the former furrows; the object being to break up, as completely as possible, the old sod, and afterwards be grubbed, harrowed, and cleanly picked of all root and surface weeds. It is unnecessary to say how often these operations are to be repeated, that, of course, will depend on the state of the land. The object to be attained is to get the land, by repeated plowings, grubbings, harrowings, pickings, etc., into the deepest, finest, and cleanest state possible. After this a heavy roller should be passed over it and the autumn preparation finished, by plowing, with a tolerably deep furrow, in the direction of the greatest slope, in which state it remains undisturbed until seed-time. The object of rolling is to consolidate the soil so that the furrow slices may remain more entire, and a greater surface be presented to the ameliorating influence of the frost and atmosphere during the winter. In case of wheat, oat, or barley stubble after green manuring, the course of preparation is the same as that just described; only that the first plowing need not necessarily be either diagonally or across the former ridges; nor does it require so much work to get it into a deep, clean, finely pulverised state.

When it is intended to grow flax as a first crop on rich sward ground, only one plowing is necessary, but this must be performed with the greatest care, and by a good plowman, followed, if possible, by the land presser; the depth of furrow should not be less than seven inches, and the slices narrow, so that the greatest amount of surface may be exposed during winter. All that is necessary in the spring to render this fit for the seed is a heavy harrowing, first lengthwise, and then in all directions. In the former two cases, in which it is supposed the soil has been made perfectly fine in the autumn, a light plowing or grubbing across is necessary, and should take place about a fortnight before sowing the seed, so that any seed weeds the land may contain, may have time to vegetate, that they may be destroyed in seed-leaf, by the after harrowings. This plowing should not be more than 3 or 4 inches deep, so as to preserve *the winter surface only* as a bed for the seed; and this important fact should be always kept in view, that flax requires an extremely fine surface, but a firm, solid bottom. From the smallness of the seed and the tenderness of the young plant, this desire for a firm undersoil, may, to a person unacquainted with the crop, appear strange, but so fully am I convinced of it, from long experience, and close observation of its habits, that it is as much on this account, as that of the benefit derived from exposure to the frost, that I so strongly recommend autumn preparation of the soil, so that it may acquire solidity during the winter, and that no part may be required to be disturbed in the spring but what is merely necessary to form a surface bed for reception of the seed; for the same reason, where the land is at all inclined to be light, it can scarcely receive too much rolling, in order to consolidate it underneath, always loosening up the surface with the harrows. There

is another thing I wish specially to direct attention to, that is, that none of the spring operations of plowing, harrowing, rolling or sowing, should ever take place *while the land is at all wet, or during rain*, better wait for one, two, or three weeks, than stir land in preparation for flax, in a wet state. All that remains now to be done is to get the surface, to the depth of 3 or 4 inches, into a finely pulverised state by repeated harrowings in all directions, pick off all stones of an injurious size, roll with a heavy roller, after which, give a turn of the sod-harrows up and down to loosen the surface. The land, now presenting an even surface, with little or no appearance of ridges or furrows, it becomes necessary, as a guide to the sower, to mark it out in beds of equal widths, which may be done by running a light one-horse plow on the surface, guided by the plowing poles set up by an attendant.

Selection of the Seed.—The selection of the seed, like every thing else connected with flax management, requires considerable care and attention. The proper time to do it, however, is not in the same order in which we describe it—after the ground has been prepared for it—but as early as it is known that the new arrivals from abroad have been received. Riga is the kind best adapted to the generality of soils, and is to be preferred as giving the heaviest crop, but where the soil is inclined to be rather heavy and clayey; Dutch does remarkably well, and is generally finer in fibre, if not quite so heavy in produce as the Riga; but whatever the kind, it should be heavy, plump, and of a shining appearance, not too dark. It is always safest to purchase from a respectable merchant, if not quite so cheap as others, as there is considerable fraud practiced in the lower branches of the flax-seed trade, such as mixing old with new, badly home-saved with foreign, and packing inferior samples in Riga barrels and wrappers of the best brands, etc., etc. Some samples of flax seed contain seeds of foreign weeds, these should always be rejected, as some of those weeds are very troublesome. The flax dodder, a parasitic weed with greyish seed, which twists itself around and actually feeds on the sap of the flax, is one of the most pernicious of these, as it is impossible to weed it out without pulling or cutting down all the flax infested with it. The well known hemp seed, so plentiful in some samples of Riga, is also very injurious, as, from its taller and more robust growth, it overtops and chokes the flax.

I procure samples from several merchants, and make a selection of two or three of the best of them, so far as appearances can guide me. I take as many balls of well moistened earth, break each in two, and having counted a certain number of seeds from each sample, say 50 or 100, and spread each kind on the broken face of one of the balls, I put them together again, and lay them in a warm place, duly labeled with the merchant's name, and kept moistened with wet moss. In about 48 hours all the good seeds will have vegetated. I then take them down and count the number of sprouted seeds in each ball, and invariably give my orders to the merchant whose sample gave the largest percentage of sprouted seeds. No matter how free of weed-seeds it may appear, I take the further precaution of passing it through a wire sieve of about 12 holes to the inch. By these means I seldom or never have bad, old or dirty seed. The sample producing the largest proportion of sprouted grains will also be found to have vegetated soonest, showing the newness and freshness of the seed. If the seed is old it will be slow in shooting; and if a mixture of old and new, vegetation will make unequal advances in a given time, and if badly saved, some seeds will be altogether dead.

Sowing the Seed.—The proper time for sowing sometimes differs considerably in different countries, of the same latitude, and also in different localities in the same country, according to soil, situation, aspect, and elevation above sea-level, so I shall give one or two general rules that the intelligent farmer can easily apply to his own particular case. Sowing should never take place until there appears good reason to suppose that the pinching frosty nights have ceased; as, not only would many of the tender plants, as they come up, be killed by such frost, but those that would escape with life would be so retarded in their growth, by its chilling effects, that should the land contain charlock or other weed-seeds, these, being of a hardier nature, would get a start of the flax, causing immense trouble and expense in hand weeding; whereas, if no hard frosts occur, and the weather genial and warm, the flax comes up and grows very rapidly and the hardier but slower growing weeds are not able to make their appearance. I would say then, sow as early as the apparent cessation of frost, the dryness of the land, and a fine settled state of the weather will admit. Sowing should never take place during rain, or when the soil is so wet that it will adhere to any implement. The proper quantity of seed is 2¼ bushels or 18 imperial gallons to the English statute acre. Some sow more and some less, but this is the quantity which I have found to give the most profitable results on the generality of soils. It is safer, however, to err on the thick, than on the thin side; as thick sown flax grows straight and uniform in length, producing only two or three bolls or seed-vessels at the very top, and its fibre is always very much superior in fineness and strength to thin sown flax, which always grows coarse and uneven, branching out be-

fore it attains a sufficient hight, and seeming to put forth all its energy in the production of an abundant crop of seed, instead of the formation of fibre. I would, therefore, sow a little more than I have stated above—say up to 2½ bushels, on light poor soils, while I would in no case sow less than 2 bushels to the English acre on the best loams. I may here state that a Riga barrel contains 3½ bushels, and a Dutch hogshead two Riga barrels, or seven bushels. Having ascertained, then, the quantity of seed necessary for the extent of land to be sown, and the land having been marked out into about 12 feet wide beds, as previously described, the total quantity of seed in quarts, must be divided by the number of beds to be sown, so as to ascertain the number of quarts there are for each bed. The sower, who must be a very careful person, and accustomed to sow grain well, should take the number of quarts thus obtained, into his seed basket or sowing sheet, and proceed to sow, going with a steady measured step, taking small tight handfuls, and throwing pretty high, strong and fearlessly, letting each cast slightly overlap the other, and taking great care, as the seed is exceeding slippery, and apt to glide from the hand imperceptibly, that too much does not escape from him in the backward swing of the hand; and so proceed with bed after bed, giving each its proper number of quarts of seed, until all is finished. Should the furrows formed by the previous plowings, not be sufficiently obliterated, the harrowing by which the seed is covered must take place in the direction of these furrows, lest too much seed be drawn into the hollows indicating the same; but should no such indications exist, then, go over with the seed-harrows across the direction in which the seed was sown, then cross-harrow, and lastly roll. If the soil is one of those characterised as "light," leave it presenting the rolled surface, but if heavy clay, it is better to break this surface again by the harrows.

Weeding.—If the autumn cleaning of the land has been properly executed, the weeding of the crop will neither be very tedious nor expensive, and where the land has been undergoing a course of deep clean tillage during the previous part of the rotation, it very often happens that the operation can be dispensed with altogether; but should weeds, unfortunately, make their appearance, as is too often the case, they must be got rid of before the crop exceeds six inches in hight. This work is best performed by women, girls, or boys, without shoes, as the tender plants bruised between shoes and small stones seldom recover, whereas treading with bare feet, or the knees, does not do the crop, at this stage of its growth, the slightest injury, care being taken to lay it all in the same direction. The weeders should work facing the wind, so that the breeze may assist the down-trodden crop to regain its upright position; and be provided with knives, to cut all large weeds, such as thistles, docks, etc., a little under the surface, the pulling of which would be apt to uproot a good many of the adjoining flax plants. Moist weather should be chosen for the operation of weeding, in preference to very dry weather, as it is easier for nature to repair any damage that may be done in the way of bruising of plants, or exposing of roots, when assisted by weather favorable to vegetation. If new dams have to be made, as soon as the weeding is finished is the proper time to make them, so that they may be filled with water, and their banks well saturated, some time before the flax is ready for

Pulling.—The proper time for pulling is a very nice point to determine, and one upon which even experienced flax growers do not quite agree. Some advocating early pulling, on account of the superior fineness of the quality gained thereby; whilst others say that by letting it become rather on the ripe side, the increased weight of clean fibre far more than compensates for the want of quality. I believe both are correct according to the market, and perhaps it is necessary for the development of the various shades and the degrees of fineness in our flaxen textile fabrics, that this difference of opinion should exist. There is no doubt but that the extraordinary fineness of quality of some samples of flax produced in certain parts of France and Belgium, and worth as much as £200 sterling ($1000) per ton, (of 2240 lbs.) is chiefly obtained by pulling the crop in rather a green state; but it is equally certain that this result is obtained at a great sacrifice in the amount of fibre. Experience shows that the medium between the rather green, and the rather ripe state is that which produces the greatest possible amount of fibre, compatible with a marketable quality; and therefore, the most profitable state to pull in. This medium point is determined, first, by observing that the bolls begin to turn from a green to a light brown color; and, secondly, by examination of the stalk, the leaves on which should have become yellow for two-thirds of its length from the ground, and also the lower half, either divested of its leaves altogether, or have them quite withered and ready to fall. This examination of the stalk is even more to be depended on than the coloring of the bolls, which, in very dry weather, sometimes commences before the stalk presents these appearances. The field, moreover, when viewed at a little distance, should have begun to assume a uniform yellowish tinge. A combination of all these appearances will indicate the proper period. Sometime previous to this, bands should be provided for tying the beets as they are rippled. Rushes dried in the

sun make the best bands, the next best are short thumb-ropes of hay, which are, however, much inferior to rushes; but in no case should the flax be tied with itself. About eight women or men will pull an acre in a day. They should gather with the right hand, catching it near the middle, and with a firm grasp, not gathering too much at each pull, so as to be able to keep it *perfectly even at the root ends.* Great attention should be paid to this keeping of the roots even, in its passage through this, and every subsequent process; as its brush-like evenness in the root end greatly enhances its value to the spinner. If the weather is wet, the flax should receive a stroke across the left thigh, to free it from any earth that may adhere to the roots; dry weather, however, is very much to be preferred, both as affording greater facility in drying the bolls, and less liability to mildew in the heart of the beets before steeping. The pullers, as they proceed, should lay down the handfuls crossing each other thus, fig. 19, and in little heaps of eight or ten, or tied in "beets," so that they will lift, for rippling, without tangling. Should there be some parts of the crop, short, and some long, either from having been grown after a green manure crop, or on imperfectly drained, or wet land, the different lengths should be pulled and kept separately, through this and every after operation, for reasons before mentioned.

Fig. 19.

RIPPLING.—This operation should take place in the same field, and simultaneously with that of pulling. In many of the best and most successful flax growing districts in the north of Ireland, there exists a sort of prejudice against rippling, or any other method of utilizing the seed, and it is therefore almost altogether neglected. This is a great mistake, as it is throwing away a large amount of really valuable feeding stuff. Some insist—judging I suppose from its returning but little to the land—that flax is an exhausting crop; an opinion which I do not entertain; but if it is so, we have all the more need to preserve carefully the only portion of the crop which may be returned to the soil, and the production of which is, at the same time, most exhausting. When growing flax for its fibre, I do not advise the saving the seed for other than feeding purposes, as it is impossible to have both fibre and seed in perfection at the same time; but half ripe flax-bolls, when properly saved and ground into meal make a most wholesome and nutritious food, when made into mucilage, and either given to calves, or sprinkled over chaffed straw or hay, etc., for older stock. The rippling comb, (fig. 20), a very simple implement, is generally made of half-inch square rods of iron, with the angles towards each other, 3-16 of an inch asunder at bottom, and half an inch at top, fixed in a block of elm. They should begin to taper 3 inches from the top, and be about 18 inches long, so as to spring with each pull, and thus save much breaking of flax. I prefer round iron as not being so liable to peel or injure the fibre. The comb should be screwed on to the middle of a short plank, fastened across a cart box, with the wheels taken off, a winnowing sheet being spread underneath, to receive whatever bolls may not fall within the cart. Two ripplers work at each comb, standing at opposite sides of it, facing each other, and, keeping firm hold of the handfuls, strike, or rather draw them through the comb; letting it take a light hold at first, until some of the bolls are off. A handy rippler can finish a handful at two strokes. Great care should be taken not to draw the handfuls farther through the comb than is necessary for taking off the bolls. A boy or girl lays down the beets, untied, at the right hand of the rippler, who lays down the rippled handfuls at his left, crossing them diagonally as in figure 19, (the advantage of which precaution will appear in the operation of spreading), to be tied up and removed by the same attendant. The beets should not exceed 6 or 7 inches in diameter, so as to be easily handled when wet, and tied moderately tight, to prevent dragging of stalks, in the after handling. If the weather permits it, the bolls had much better be dried in the field, spread out on winnowing sheets, and kept constantly turned; in wet weather they must be carted to the farm-yard at once, and spread out in sheds, barn floors, or lofts, all doors and windows being left open to promote a free circulation of air, and prevent heating, which, from their oily nature, they are exceedingly apt to do, and which would materially injure their feeding qualities. Their drying is greatly facilitated by passing them through a winnowing machine, with a coarse riddle, thereby removing leaves and straw. When nearly dry, they should be taken to a corn kiln, and their drying completed, very slowly, and then ground into meal, husks and seed together. If oat tailings or mill seeds be mixed with them, it will counteract the tendency of the oil to clog the millstones. The rippled flax should be put up into long, two-row stooks of 12 beets each, where it may remain for 2 or 3 days, if the rippling cannot be finished sooner. Some recommend great haste in committing it to the water, if not the same day it is pulled, at farthest the day after; but in my practice I have never been able to find out the great virtue in this precipitation. It is always attended with great inconvenience, especially if the quantity is large, without compensating advantages. If the proper time for pulling has been nicely hit,

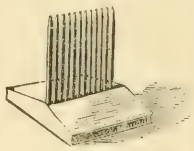


Fig. 20.—COMB.

the flax will receive no injury by remaining out of the water until the third day, which will afford time for the rippling to have been completed, and for the sap to become uniformly disseminated before steeping. It is of great importance that all the lot should be ready to go into the water at the same time, so that it all will be fit to take out together, and that the taking out of one part of it may not disturb the fermentation in the other.

Watering or Retting.—This has very justly been termed the most important process the flax, while in the hands of the grower, has to pass through; for, no matter how suitable the soil, how well it has been prepared, or what amount of care and skill may have been brought to bear on the operations of sowing, pulling, etc. No matter, in fact, what train of fortuitous circumstances may have conspired to render the crop one of the best that possibly could be grown; a single day, nay a few hours, under or over watering, may reduce it 30, 40 or 50 per cent in value. More than this it is unnecessary to say, in order to bespeak the entire attention of the new and inexperienced flax grower to a description of the method, rules, and indications which practice and experience have proved necessary to the bringing of the crop safely, and in the most profitable state, through this critical process.

The "dams," as I have remarked elsewhere, should be made some weeks or months previous to the pulling of the crop, and where an unfailing supply of water can be depended on in the driest season. They are generally made 3½ to 4 feet deep; and single dams, or those accessible only on one side, 8 to 10 feet wide, whilst a width of 16 or 18 feet is found convenient for double dams, or those accessible on both sides. The sides should be cut with a definite slope, as in fig. 21, to guard against the falling in of banks, when saturated by the water.

The choice of position of the dam is, of course, limited to a great extent by the water supply;

Fig. 21.—DOUBLE DAM—CROSS SECTION

but as far as this limitation will admit, a warm situation, as the south side of a fence, should be chosen in preference to the north side; and the soil should be sufficiently retentive to prevent much loss of water by leakage, and the consequent cooling of the dam, by the necessity of keeping up too great a feed stream, to supply this loss; water must stand at an equal depth all over the dam. If circumstances admit of it, it is also very desirable that the position of the dam should be such as to command some gently sloping ground on a lower level, with a view to running off, and utilizing the flax water, as a top-dressing or irrigation for grass land. This water contains very considerable manurial qualities, and should always be made use of when practicable; and it is desirable that gravitation should be pressed into our service, for the purpose of distributing it over the land. Soft water is the best for retting flax. River water, or that which has ran a considerable distance, exposed to the sun and air, should always be preferred; while spring-water, and that impregnated with lime, iron, or other mineral substances should be avoided as much as possible, as the former is always quicker and more certain in its action, and mineral waters are apt to discolor the flax more or less permanently. Beginners are generally apt to think that, to be successful, they must produce flax of a very white color. This is quite a mistake, as flax of a nice silvery *blay* is quite as marketable, if not more so, than the very white. Any discoloration, of vegetable origin, such as that caused by weeds in the flax, or from the banks and bottoms of old dams being covered with vegetation, or any which takes place in soft water, is no blemish whatever, as it is easily got rid of in the bleaching process which the fabrics made of it must all undergo; and it often occurs that blay flax is found to possess the fine, soft, silky quality, to a larger extent than the purely white. There are certain minerals, however, which, if they exist largely in solu-

Fig. 22.

tion in the water in which flax is steeped, impart to it a dull leaden color more difficult to get rid of in the bleach—it is only this latter case, then, that is to be guarded against. In the case of river water it need not be let into the dam (unless for the purpose of proving the latter) until after the flax is placed in; but when spring water has to be used, the dams should be filled with it some weeks before the flax is ready for pulling, so that it may have time to become somewhat softened, and warmed by exposure to the air and sun. Having got all ready; and the flax alongside, it must be placed in very carefully—in case of a dry dam, by a man standing in the bottom, and in case of a dam previously filled with water, by a man standing first at the end, and then a short plank or board placed on top of the flax. A person on the bank hands the bects to the man in the dam, who, commencing at one end, places them in regular rows across it, root end down, and standing at an angle of about 75 degrees, (fig. 22.) and so proceed till all is in. By observing this angle and posit on, the dam will be full enough

without a second row, which some put in, but which is objectionable; another advantage that this position of the beets has over the flat position adopted by some, is, that the coarser and more easily "watered" root ends occupy the cooler and more slowly retting part of the dam, while the finer, and more slowly affected top ends occupy the warmest part of the dam; and thus the retting process is kept up equally along the whole length of the flax. When the flax is in, it should be all covered over, to the depth of about an inch, with rag-weeds, or, in case they cannot be got, then, with other weeds, grass, ferns, or vegetable subtance of some sort; and in case of new dams, the bottoms and sides should be lined with something of the kind. Rag-weed, *Ambrosia artemisiafolia*, is preferable, on account of the quantity of potash it contains. Some keep down the flax by covering it all over with sods, but although fermentation goes on well under them, they are, nevertheless, objectionable, on account of their dirtying the flax, and the trouble and expense of replacing them every year, by fresh ones; flat stones are, therefore, to be preferred, as being cleanlier, more convenient, and inexpensive, for, when once collected they can be piled up beside the dam and used year after year for any length of time. The weight of stones put on should be such as to keep the flax barely resting on the bottom, half suspended in mid-water, but sufficient to keep it from rising higher than within six inches of the surface.

In about three days it will rise a little, showing that fermentation has commenced; a few stones should now be put on, here and there, to counteract this bouyant tendency. In about four days more it will begin to sink again, when the extra stones must be removed to enable it to regain its former position. From this time constant attention, and frequent examinations are necessary, as, if all is going on right, it may be expected to be sufficiently watered any time from the 8th to the 14th day. In the case of spring water, however, it sometimes takes three weeks, and if later in the season, even longer, it is always safest, however, to examine it after the 7th day, by getting into the centre of the dam, taking up a stone, and thrusting down the hand into the heart of a beet, if it feels hard and wiry to the grip, the examination may terminate here for the present, to be repeated the next day, and from day to day, until it is found, when pressing it in the hand, to be a shade softer; then the examinations should take place every 12 hours, and when decidedly softer to the grip, a beet should be taken on top the centre of the dam, opened, and a little lock, of about twenty stalks, from the heart of the beet, bent across the fore finger in several places, if the shove or woody part of the stem only bends, and does not break, or if only few of them break, and there is no appearance of loose fibre becoming detached from the stem, then it must be replaced, and examined in the same way, and in several parts of the dam, every six hours, until most of the stalks break freely when bent across the finger, and start out, clean from the fibre. When this is found to be the case it is either ready or on the point of being so; but a further and last test has to be applied. Having opened a beet take from the centre of it a medium sized stalk, not the finest nor the coarsest; break the shove quite through, in two places near the middle, about six inches apart, and having freed the lower end of this broken bit of wood, carefully from the fibre, catch it with the finger and thumb and pull it out *downwards*; repeat this on several stalks, and if all or most of them pull out freely, without breaking, tearing the fibre, or having any of it adhering to them; then the proper time has arrived for taking it out. At the same time that this latter test applies; on looking over the open beet, it will be observed that in a great many stalks, the fibre shows a tendency to loosen, and detach itself from the woody part, of its own accord; no time should now be lost in taking it out, which should be done carefully, and by the hands, instead of forks, taking care not to break or double the flax. If taken out at the time indicated by the above tests and appearances, after draining for an hour or two on the bank, it may be drawn to the spread-field, and dropped in separate beets as the carts pass along, so that the spreaders may find them as required. Although this process of retting, is, from the quickness of its action, in some cases, the most critical that the flax has to pass through, yet, with a little experience, it becomes a very easy matter to conduct it safely through, and indeed, the tests are so simple, practical, and easy of application; and the appearances which indicate the proper state, so easily determined, that even the beginner need have no fear or hesitation, in undertaking it.

In every new flax district, we generally find ten times more flax spoil through under, than over watering. The inexperienced farmer, in his first or second attempt at flax growing; knowing that it is so easily injured in the water, becomes oppressed with an overload of fear, and intending to be very cautious, says to himself. "I have a fine crop so far, if any misfortune should happen to it now, I will be broke. I will therefore, take care, and not give it too much of the water, and whatever it wants of being well enough watered, I can make up for it on the grass," and thus gets involved in the very evil he was so much on his guard to avert. No exposure on the grass can ever wholly make up for defective watering. The action of alternate dews, or showers

and sunshine will bleach and soften it no doubt; but, unlike that of fermentation, it will weaken and make towy the fibre before dissolving the gum which binds it to the woody stem. Far better is it, should an inordinate fear of over-watering have caused one to take out flax a day, or a few hours, to soon, to let it remain in rotheap on the bank for a night, or a few hours longer. When flax is over watered there will be a great waste in scutching, a great deal of the fibre breaking and forming tow, but what will remain, will be of a very fine silky quality. When under watered, the same waste takes place in the mill, the increased amount of power which must necessarily be employed to free it from the shove, breaking a great deal of the fibre and dragging it among the tow, with this additional evil, that what remains is harsh and coarse in quality. Care should be taken that a slender stream be admitted to the flax dam, during the process of retting; just sufficient to supply any loss that may take place from evaporation and unavoidable leakage. Provision should also be made against the possibility of flood-water breaking into the dam, as the process of retting never goes on so satisfactorily again, after having been interrupted by any means; and lastly, a second batch of flax should never be steeped in the same water. This is a point almost universally overlooked by theoretical flax instructors, and one on which the inexperienced are very often led to commit very serious mistakes. Such persons are apt to arrive, too hastily, and without due consideration, at the conclusion, that, as a matter of course, fermentation will take place more quickly in sour water than in fresh; but practice shows that the reverse is the fact with respect to flax and old flax-water, as the former is always sure to "sit" in the dam.

Spreading.—Clean thick open pasture ground, free from the shade of trees, should be selected as a spread-field, should there be any weeds on it, they should be mown even with the sward, and removed as soon as the flax has been put in the dam. The spreading, which is performed chiefly by women and girls, but sometimes also by men, should commence at the same time that the carts commence to drop the beets all over the field, as, if allowed to dry in the beet, the flax does not separate freely. Each spreader—standing with her back to the wind, if there is any; but if calm, towards that point whence the prevailing winds come—takes an open beet on her left arm, from which she takes a handful, lays it down on the grass, root end next herself, and spreads it with the right hand, very evenly, and so thin that the grass can be seen all through it, and in a perfectly straight row, running from right to left of the field, keeping each row a few paces in advance of the other as in fig. 23, and the tops of each row overlapping the roots of the preceeding one about two inches; this slight overlap is a great protection against wind, and as there is no fibre on the roots it is of no injury to the flax. Should any little locks be left unseparated, they

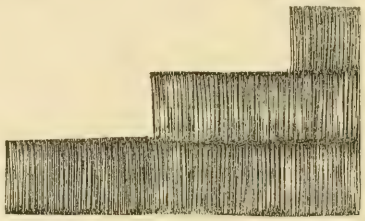


Fig. 23.

may not dry evenly, or if they do, the flax, when dressed, will present a streaky unevenness in color, from unequal bleaching, hence the necessity of even spreading. If the directions under the head of Rippling have been attended to, the spreaders will find no difficulty in separating the handfuls, without any tangling or dragging of stalks. Some recommend turning the flax after lying a few days on the grass, which is done by running ash wands under it, and turning it right over its root end, but if spread sufficiently thin and evenly, this operation may be dispensed with altogether, and indeed with advantage sometimes, in case of wind, for if once moved on the grass, the flax never lies so close again and is very apt to catch the wind and be blown about. Turning is never practiced in the best flax districts in Ireland. The bands, as they are taken off the beets, are thrown on the grass, under the flax, so that they may be found where they are wanted when

Lifting.—If flax has been properly hit in the watering, it should be fit to lift, at whatever time it is found perfectly dry, between the fourth and the eighth day, and these are the appearances it should then present: The "shoves" should clean out very freely, when a little lock is rubbed between the hands; and upon looking over it, as it lies on the grass, a great many stalks will be found to have formed bows and strings, by the contracting of the fibre, and consequent bending of the stalk. When these appearances take place within the above time, it is a pretty sure sign that the watering has been rightly managed. It should never be necessary to leave it on the grass longer than the eighth day, but in no case should it be allowed to lie until the grass begins to appear through it, for then it is difficult to get it perfectly dry, and besides, it is almost certain to mildew, which weakens the fibre very rapidly, and spots it all over. Lifting should not commence until the dew is quite gone. The lifters commence at the side of the field where the spreaders left off; each one standing at the root end of the flax she is lifting, takes a row from

right to left of the field, lifting or gathering the flax with the right hand, and letting the left lie on the bundle as it is gathered. Those accustomed to the work can canter along, and get through it very quickly, but great care must be taken to keep the flax perfectly even at the root ends. The flax is bound into beets of about eight inches in diameter, with the bands that are uncovered as the lifting proceeds, and should be carted under cover of barns or sheds, or built into stacks, before the dew falls in the evening. If wet weather prevent the lifting taking place at the proper time, and there is danger of the flax becoming too soft, it should be taken up, even wet as it is, and set up in conical heaps, like an extinguisher, or the thatch of a beehive, (fig. 24) with a band loosely tied around the top: in this way it receives very little injury from the wet, as the air, passing freely through it dries it very quickly, even in showery weather; it should be attended to between showers, and bound up and secured as soon as it is found dry.

Fig. 24.

Breaking.—The operations of breaking and scutching are best performed by mills fitted with the proper machinery for the purpose, and where they exist, of course, farmers will avail themselves of them to a great extent; but as the cultivation of the crop generally preceeds such machinery in districts where it has not been previously grown, and then manual labor has to be resorted to, for the purpose of cleaning it, before the introduction of machinery. Moreover, as breaking and scutching are very extensively performed by hand, in districts supplied with the best mills, through economic motives, where the farmer may have plenty of help, and little to do in the winter, I describe, briefly, a few of the methods usually resorted to in such cases. The most primitive of these is simply pounding the flax straw with the common beetle on any hard smooth surface, such as a stone, or block of wood, preparatory to scutching. A speedier and less laborious method of breaking, is by a lever flax brake, constructed precisely the same as the lever turnip cutter, only with blunt knives. Another flax brake of about equal merit is the "crig," (fig. 25), a block of beech or sycamore, about the size and form of a plane stock, with a beat handle mortised into it. The flax is spread out about 6 inches deep, on a hard flat surface, sometimes a barn floor, sometimes the public road: two men facing each other, and moving backward and forward over the flax, beat it alternately, with these crigs, swinging them round their heads, and changing them from right to left, each alternate blow, until it is quite crushed and soft. There is a plan of flax breaking much superior to any of these, which is used extensively in the north of Ireland. The following is from a letter of my own, descriptive of it, in the *Irish Farmers Gazette*. "I think it is better adapted to new flax districts than any of those you described—first, because there is no skill required in the operators beyond ordinary intelligence; and secondly, because there is no machinery, whatever, needed, except what we must presume is already in the possession of every flax grower—namely, horses and carts. I believe there is more flax broken in the North by horses and carts, on the public roads, than by the millstone. It is a very speedy and effectual plan of breaking and does not tangle or toss the flax. A hard, level road is selected; the beets of flax opened and spread out in rows, about 6 inches deep; the carts are loaded with stones, and drawn along the rows, a wheel on each row, the horses walking between, and the drivers sitting on the carts. As the work proceeds, the rows of flax are shifted out and in under the wheels, by little boys and girls, with rakes, and turned once or twice. The quantity laid down at a time may only be limited by the help at command, as it is desirable to finish off each day's work in itself; but the largest farmer generally has as much help gathered as finishes off all his flax in one day. The farmers of a townland or district very often join, and spread down their flax in a line, one after the other, leaving two or three yards between each lot, all the carts going from one end of the line to the other before turning. There is considerable economy in this, as there is much less time lost in turning, it can only be attempted, however, in fine weather. This plan is adopted not only when hand-scutching is resorted to, or in preparation for mills having no breaking machinery, but very frequently also in preparation for mills supplied with the best fluted rollers, as the farmer thereby effects a considerable saving, flax millers charging half-a-crown less per cwt. for scutching flax that has been broken previous to coming to the mill."

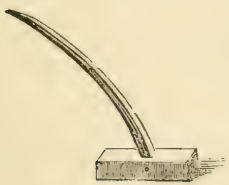


Fig. 25.

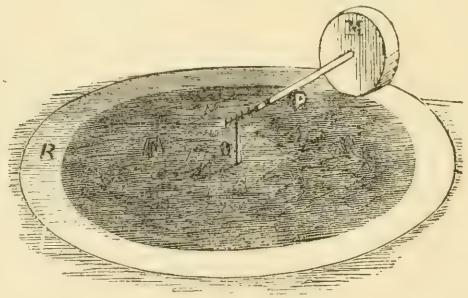


Fig. 26.

But the best of all the home methods of breaking, is by the millstone, (fig. 26); this machine is simply a millstone (M), supported vertical by a horizontal pole (P) about 30 feet long, attached to and movable on, an upright post (O), occupying the centre of a well hardened ring (R), round which the stone travels on edge, drawn by a horse, over the flax, which is spread out six or eight inches deep, and turned occasionally; the pole can be moved out and in on the centre pivot, to cause the stone to traverse all parts of the ring of flax.

Scutching.—Flax broken by any of the above methods is fit for scutching either by hand or mill; but first of all, it must be streeked; that is made into handfuls, each handful or "streek" crushed in the middle, between the hands; so as to bend over the scutching stock, twisted a little so that they will separate freely again, and tied into beets with two bands (fig. 27) ready for the scutcher. The implements generally used in scutching are very simple, consisting merely of a scutching stock (fig. 28), which is a deal board about 5 feet long, with a notch in it to admit the streek, and fastened to a square block of wood, to keep it upright; and the scutching handle (shown leaning against the stock) which is a very thin board of sycamore, about 2 feet long, with a handle at one end to hold it by. The streek of flax is placed and held firmly by the left hand, in the notch on the stock, while it is beat with the sharp edge of the scutching handle, held in the right hand, by a succession of blows, slightly curved, tangent to the face of the stock. The streek is turned and opened out occasionally, and the scutching repeated until the shoves are all cleaned out. Where the quantity is not very large, and where there is plenty of help that must be maintained on the farm in the winter, this is a very economical way of preparing flax, as it generally yields one eighth more than the mill; it is, however, a tedious method, and, therefore, where large quantities of flax have to be got through, machinery must be employed if within reach. Various scutching machines, more or less portable, each claiming some superiority over the other, and all doing their work well, have been invented of late years. I have seen most of these machines at work, and admire the ingenuity displayed in some of them, but I have not yet seen the machine I would prefer to the old stationary mill, with the "handles" or "wipers." The mills are nearly all now supplied with the patent fluted American Rollers, for breaking, which perform their work in a most efficient manner. Where a choice of mills can be made, that one should be patronised which is fitted with the best machinery, and which has the most careful scutchers, and where these are paid by the day and not by the cwt. When scutched, and made up into full length beets and tied with three bands, the flax is ready for market; but if kept under a heavy weight, in some cool dry place, for about two months, it will sell to much greater advantage, as it acquires a soft silky appearance, and also increases in weight.

Fig. 27.

Fig. 28.

Hitherto, I have considered flax as grown for its fibre; the appropriation of the half ripe bolls, to feeding purposes, being a subsidiary use; but as some flax must always be grown for its seed, as a primary object, the fibre of which though useless in the finer branches of the trade, is still of considerable value in the manufacture of canvass, sacking, and other coarser materials, it may be as well to state that the proper way to treat the flax straw, when the seed is taken off, is to stack it up and keep it dry till the warmest time in the following summer, then steep it and treat it as if had been grown for the fibre alone.

Although undoubtedly a critical crop to manage, requiring the greatest carefulness of manipulation, in all its many stages, yet it is to be hoped that by strict attention to the foregoing plain instructions—which may be relied on as the result of long and extensive practical experience—few can fail of success in, and none need fear to undertake, the cultivation of flax.

THIRD-PRIZE ESSAYS.—No. 5.—BY WM. H. WHITE,

SOUTH WINDSOR, HARTFORD CO., CONN.

Flax is partial to no particular climate or country; having been grown in the Northern part of Russia and in the countries of the Torrid zone, from the remotest ages of which we have any history. We read of it in the Sacred Volume, as raised in connection with barley in the days of the Israelites in the land of Egypt, and by them made into fine linen fabrics.

Soils.—Flax will grow on nearly every kind of soil by attention and good culture; but some soils are better adapted to it than others. A rich mellow deep loam free from wet is the best. If the soil or subsoil be retentive of water, it should be well drained. Dry, sandy soils as well as wet bottom lands are unsuitable, and will cause failure, from mildew. To produce the best returns a thorough system of rotation should be followed. The soil should be in good heart and freed from weeds, by previous clean culture, as they are the bane of the crop. A clover sod, an old rich pasture, or land under a hoed crop the previous year, is usually the best for a good crop of flax. Such lands should be thoroughly plowed in the fall, not less than eight inches deep; (better subsoiled,) that it may be ameliorated by the frosts during winter. Deep mellow soil gives the roots a chance to penetrate to a good depth. In the Spring, as soon as the ground is dry, it should be plowed again three or four inches deep, and if in good heart from previous manuring, no additional fertilizers will be necessary. Should it be necessary to apply manure, a mixture of equal parts of plaster, salt, and ashes, form an excellent fertilizer, applied at the rate of four to six bushels per acre, after the land is plowed and harrowed in the Spring. Fresh manures, or those containing much nitrogenous matter, or any containing weed-seeds, are utterably unsuitable to apply for this crop. The finer the soil is made, the better the crop, the more even the growth, and the finer the fibre produced.

Seed.—Flax having been raised more for the seed than for fibre in general in this country for years past, and as such seed produces a poorer quality of fibre and more branchy short straw, it is unsuitable for producing good flax, where fibre is the object. Where seed only is the object, it is sown thin, and branches low, produces several heads; and the fibre is short and knotty, as well as coarse. Riga seed, which may be procured of reliable seedmen, is the best for fibre; yet this often contains weed-seeds and should be screened through a wire sieve, of 12 holes to the inch, and winnowed. Where Riga or Dutch cannot be obtained, select from the best in a place where flax has been raised for fibre in our own country. Select none but clean, bright, shiney, heavy seed. It is best changed from a distance occasionally, as if grown in one soil continually it degenerates; this is seen in branching low, and producing several heads, and when this occurs it is time the seed was changed.

Sowing.—The land having been prepared by plowing, harrowing, fertilizing, roll to complete the pulverizing, and sow the seed broadcast, at the rate of two bushels per acre. Too little seed is used generally here to produce good fibre, and still more seed will produce a better article. Divide the land into beds of about ten feet each way, to facilitate the sowing, and evenning of the seed. Sow one half of the seed lengthwise of the field, and the balance across. Great care should be used in sowing, as the seed is slippery, and is liable to fall unevenly. The seed having been spread as evenly as possible, take a light seed harrow and go both up and down, and crossways of the field to spread the seed even, and prevent it falling into rows made by the harrow teeth as liable when harrowed but one way. A very light harrow should be used to prevent covering the seed to a greater depth than one inch. After the harrowing, to leave the surface in the best possible condition, to prevent weeds from growing, and facilitate harvesting by pulling or otherwise, it should be again gone over with the roller, if the soil will not adhere to the roller. Remember, the object is to obtain the best, and most even fibre, and the greatest amount from a given area; and to do this the land need be in the best heart, and the soil evenly comminuted, as near to good garden mould as possible. If none but clean seed is used, and the foregoing directions strictly followed, very little fear need be felt of weeds injuring the crop. The sowing should be done as early in the spring as the ground is sufficiently dry to be properly worked, and fears of hard frosts are past. Labor being so high, and laborers scarce, it is out of the question to thinking of weeding the crop as is done in foreign countries; and indeed little is gained if the requirements heretofore mentioned are carried out. The crop is either pulled or cut.

Pulling, for the small grower, is the best and most economical, as it gives a greater quanti

ty of better fibre. To determine the time when to pull, calls into exercise the best judgement of the cultivator; if pulled a little too soon, or a little too late, a waste in tow, or loss in quality of fibre, causes a depreciation in the product. When the seed bolls are about half turned brown, or upon opening the bolls, the seed is beginning to turn from a green to a light brown, the leaves fall, and the stalk turns yellow two-thirds of its length or rather more, is the proper time to pull to produce the best fibre. Should any of the crop have fallen down and be suffering from wet, it should be pulled, if not ripe, and kept by itself, as it will rot and become a total loss if left. Should the crop from any cause grow uneven either in length or coarseness of stalk, such as is alike, should be kept assorted and by itself, not only in pulling, but in the rotting process. It is easier assorted in pulling than afterwards. The puller should clasp the flax just underneath the bolls, which will leave the undergrowth, and weeds standing; no more stalks should be grasped than will come up without breaking or otherwise injuring the flax; as soon as a good handful is pulled, it should be laid with the roots all in one direction, and even as a brush. It is best kept even by taking time and evenning each handful before spreading. It is spread thinly and evenly in swarths similar to grain as left from the cradle. When dry, it is gathered into bundles about the size of a man's thigh by a hand rake, great care being used to keep the root ends even and the straw straight. After lying an hour or two in mid-day to dry, it is bound, by taking a few straws of flax in the right hand, near the roots, then reaching over the gavel, run the left hand under, raising the gavel a few inches, grasp the root end held by the right hand, and draw the band around, letting it slip through the right till about in the centre on top, draw tight, then give one and a half turns with the top end of the straw with the right hand around the root end held by the left, tuck the top end under, and between the band and bundle, and it is bound. Set the bundle up firmly on the roots and pass to the next, and proceed in like manner till the whole is bound. The foregoing presupposes that you will have fair, pleasant weather in pulling and taking up the flax; wet or foul weather will cause more or less damage to the crop. In good weather the bundles can stand in the field one or two days, and dry sufficiently to be carried to the barn or to the stack; the former is preferable when convenient. Where a large quantity is raised and help is deficient, resort in gathering must be had to the cradle or machine reaper, but it is a wasteful way, giving stumpy ends to the fibre as well as a loss in the quantity, I do not recommend this mode. Far better raise a less area, only what can be pulled with the help at command. Pulling has been, and now is, the custom among all nations, and practised by all successful producers.

HOUSING.—It can be carried on a common hay wagon, care being used in loading, and handling, not to break the straw, which is apt to waste fibre. If laid up in the barn, it should be on open scaffolds, where the air may circulate around it The floor of the scaffold may be rails, or poles laid a little open to admit of a better circulation; the looser the bundles are packed the better. If the flax has been well dried previous to being taken from the field, there is no danger of its getting harm in the barn. Should you have room in stables or sheds where there is free circulation of air, the flax can be got in before drying thoroughly, and the danger from rain thus lessened. Should it be necessary to stack it out, a foundation of poles should be laid a foot or more from the ground; a "stack-pole" consisting of three poles set a little apart at the bottom and fastened together at the top, is placed in the centre about which the stack is built. These poles may be a little shorter than your stack to admit of a thatch covering. Commence at the bottom, and set the bundles slanting at an angle of about thirty degrees, around the stack pole; outside of this place another layer, letting the roots rest on the foundation, enlarge in like manner to the size you wish your stack. On to this build the next layer or course, observing to keep the stack true and even, build the sides perpendicular, or swell a little in the centre, drawing in at the top to finish off, similar to a stack of wheat. Give a good thatch covering, and fasten on by straw ropes passing over it, and tucking the ends into the stack to secure them.

THRESHING.—In the month of September is a good time usually, the weather being dry, the seed may be removed in a variety of ways, two only of which I shall describe. First, by the threshing machine. Open the concave so that the teeth will just come together; then with one to open and pass the bundles, another takes them by the root end, spread in fan shape, and applies the seed end to the machine, holding the straw firmly in the hands, and withdrawing it as soon as the seed is torn off, he passes it to the third who gives it a whip to shake out loose seed, binds it again and lays it aside. Other ways are to pass the seed bolls between rolls and crush them; and to whip the seed out over a stone block, or head of a barrel. Take a stout barrel with long chines; set it on one end on a tight floor and take a bundle of flax and whip the heads over the chines and head of the barrel, and the seed is soon shelled out if the flax and weather be dry. The flax should be laid convenient for handling before commencing. The seed may be whipped out in

this way from the product of an acre by one hand in two days, or less if he be expert. The seed is cleaned by the fanning mill, or may be run through a sieve in a draft of wind. Seed needed for future use is better left in the straw till wanted for sowing; it perfects itself and keeps better.

Rotting.—The next step after clearing of the seed is rotting. Two ways are practised in rotting; by steeping in water, called "water rotting," and what is termed "dew rotting." The former is the more expeditious and by some thought the best; the latter the way most practised in this country, it being the less inconvenient and least offensive in handling, etc., during the rotting process. Water containing iron or other mineral substance, or hard water, that will not bear soap, are unsuitable, and should never be used. A sluggish stream, where there is a constant change of water may be employed; but it is safer to dig a pit near the bank of some stream, or where the water of a spring may be conveyed into it; it should have also an outlet where the water may run off as fast as it is supplied; such pit should be of a size proportioned to the quantity of flax to be rotted, and from 3½ to 4 feet deep. This pool should be in a position to receive the full heat of the sun; and if to be filled from a spring, it should be let in several days before putting in the flax, to give the water time to soften a little; river water may be let on the same day, or the day before. Place the bundles of flax in the pool in an inclined position, loosely, with the roots down, in regular rows, the roots underneath the tie of each row of sheaves to reach the roots of the previous one; fill the pool, or put in what you may wish. Cover the flax with some straw, weeds, or boughs of trees, and place weights on top to keep the bundles of flax just underneath water; it should not be sunk on the bottom, or allowed to rise out of water; consequently the weights may need to be varied in the different stages of watering and fermentation. No exact time for the flax to remain in the water can be given as an infallible guide. The time varies from six to fifteen days, depending upon the weather and water; the warmer the weather and water the sooner the process is completed, and vice-versa. The only infallible guide is to test the flax by taking from the centre of a bundle an average sized straw, and break from near the centre a piece of the woody part, about six or eight inches, and draw it out downwards; if sufficiently watered the fibre will slip out without breaking, and it is immediately removed to the grassing ground. It is better a little under than over rotted, as it can be remedied in the grassing. Over rotting weakens the fibre and makes it worthless, or nearly so. It should be taken from the water carefully, so as to avoid breaking or otherwise injuring it. The best way is, for one to stand in the water and carefully lift the bundles out to an attendant, who receives them and places them on the root ends, where they may remain to drain a day, or perhaps a little more. They should not be placed too compactly, or too many together, without some intervening space to give air to prevent heating.

Grassing.—A clean thick sward, usually short fed pasturing, clean from weeds, etc., is the most suitable for this. Lay the flax in swaths, roots all one way and even, spread thin and even, leaving a space of about a foot between each swath or row. In three or four days, if the weather be humid, and warm, or longer if dry and cool, it will be best to turn it over to complete the rotting. This is done by taking a smooth pole about ten feet in length, and running one end under the flax near the top end, and turning it over, letting it rest on the ground, taking care to keep them even.

Lifting.—This is done when the flax is rotted, so that the woody part of the straw will readily part from the fibre upon being crushed in the hand or brake, without tearing or breaking the fibre. Fine, and coarse straw, will rot unequally, and should be kept separate. The middle of the day in clear, dry weather, is the best time to take it up. It is then raked into bundles somewhat larger than at first and bound as before, recollecting to keep the roots even as a brush. Set the bundles up on the root ends, and allow them to stand and dry a few hours. In good drying weather it will do to cart direct to the barn and be stored as before directed, or stacked. If the weather is "catching," (likely to shower), the straw may be set up with the roots spread and the tops together, in this way it will dry sooner, and may be sooner secured.

Dew Rotting.—Is the way generally practised in this country, and the least unpleasant in the operation. About the first of October, the straw is taken to a moist meadow where the grass is short and thick, with no weeds, rushes or other growth. The straw is spread thin and even as directed for "grassing" under "water rotting." As the weather may be either warm, and damp, or cool and dry, the time of rotting varies accordingly; a longer time being required in the latter, than the former case, varying from three to five weeks or more. After lying about half the time necessary to rot, depending on the weather, it should be turned as before directed. The same tests are also applied as directed under water rotting, to know that the rotting is completed. When the straw is gathered, bound, housed or stacked as before described.

Breaking, etc.—This is usually done during dry weather in winter, or spring. Not having

had experience with any of the improved or late patented brakes, I can not give instructions in their use; but give the primitive way of dressing, practised by many of the small producers, and which is within the means of the humblest pioneer settler; remarking here, that in a community where flax is raised to any considerable extent, it would pay for the producers to unite and procure one of the best of the late improved brakes (if no single individual is able or willing;) and use it in common. The cost varies according to the size and capacity of the machine. The old brake requires but little ingenuity, and can be made by any carpenter in a few hours after the materials, which are seasoned hard wood, are together. In addition to the brake, a Swingle Board and Blade, and a coarse Hatchel are necessary. The Brake consists of two end posts, seven blades, and a head; the rear post is twenty-eight inches long, tapering from the bottom up, 6×20 inches at the bottom, 6×12 at the top; into the top of this four blades are framed 1½ inches apart, and made fast so that the top edge of the blades are three inches below the top of the post, three other mortises are cut in from the top for the three blades to hang on a pin or bolt, and to work up and down; into these mortises the three upper blades are put, and a pin of ½ or ⅝-inch iron is passed through the post and blades, the three upper blades are framed into a head 12 inches long, 6×12 square, one inch apart. The lower edge of the blades drop one inch lower than the head. Into the front post, which is 6×12 and 24 inches long, the four under blades are framed fast, one inch apart, the upper edges rising one inch above the top of the post. The whole brake is four feet long; the blades are made of one inch stuff, and are put one and one half inches apart in the rear post; the under blades are four inches wide; the upper ones 4½ inches; the blades are bevelled to a rounding edge one side ,and shut into each other; when shut they lap about one inch. A 1½-inch wooden pin put into the back of the head for a handle to lift and shut the brake, completes the same, except a brace from one post to the other, near the bottom, to keep them firm and steady. The swingle board consists of a hard-wood board 3 feet long, 12 inches wide, and one inch thick; this is bevelled to a wedge shape at the top, and fastened at the bottom to a block two feet long, 4×12 inches, and stands upright. The Swingle Blade is a stick about two feet long, two edged, somewhat thicker in the middle, with one end rounded for a handle. The Hatchel is made by setting sharp pointed iron pins, about six inches long, made of $^{5}/_{16}$-inch iron rods, into a hard-wood board. Then teeth are set ¾ of an inch apart in a square of six to eight inches wide.

To break the flax, take in the left hand as much straw as can be held, near the roots; with the right take hold of the handle of the brake and raise the head, introduce the straw between the blades, to about the middle of its length, and work the brake up and down, shifting the straw along. Turn the straw, taking hold of the broken end, after whipping and shaking out the loose shives, and break the root end. Repeat the operation, and when well broke and the shives whipped out, it is ready for swingling, etc. It is better while one breaks to have another swingling to receive it as fast as broken, in that way two expert men may dress fifty pounds or more of dressed flax in a day. Should but one work at a time, after the flax straw is broken it is laid one side carefully, kept straight in handfuls, till a quantity is broken, and then swingled. To swingle, take what is readily clasped between the thumb and fore-finger a little one side of the middle, throw the longest half over the swingle board, which should have a rounding end edge. With the swingle blade a few strokes are given it to brush out and loosen the shives; it is also drawn through the hatchel which tears off more, again it is whipped up and down with the swingle, over the swingling board, and alternately hatcheled till free of shives, after which the other end is turned, and the operation repeated. It is next drawn through the hatchel to straighten it. Then take it by the ends, one in either hand, hold one end fast, with the other twist a few turns by moving the hands in a circle, giving a twist at each time; after a few turns bring the ends together, doubling in the middle, give the "hand" of flax a turn or two, and twist the ends together, and tuck them into the hand to fasten and lay it aside; proceed in like manner till the whole is done.

Preparation for Market.—To prepare it for market several of these hands are put together and tied. A press is best for this part; it may be made with a stout bottom, with end pieces well braced, one end is no higher than the thickness you wish your bundle; the other may be fitted for a lever to press the bundle before tieing. Place two cords a few inches from where the ends of the flax hands come in the press, and lay the hands, in layers, the large ends alternately either way, till you have twenty-five or thirty, then press with your lever, and tie. It is then bagged or baled, similar to wool, if to be sent a distance; if marketed near this is unnecessary; it may be carried in the bundles using care in handling. In conclusion I would say, flax should not be raised on the same land oftener than once in five years, and better seven years; a system of rotation should be pursued where it is intended to raise it regularly; that system must be left to the

good judgement of the producer, remarking that when it is raised on old plowed ground it should follow a hoed crop, where the ground has been kept clear from weeds; such we usually find to be tobacco, corn, potatoes, and carrots. Success in the culture of flax consists mainly in good plump clean seed; good soil clear from weeds, well pulverized, and rich; perfect rotting, and dressing without having it rotten. In the foregoing essay I have endeavored to give, in a concise manner, full details for raising and preparing flax for market, in a primitive way. All the labor and trouble of clean and thorough culture, as well as the rotting, either by water or dew, is as necessary with the improved methods as with the old, for on these the *quality* depends.

THIRD-PRIZE ESSAYS.—No. 17.—BY G. S. KUESTER,

NEW CASTLE, LAWRENCE CO., PA.

Soil.—The soil should be of the best quality and in the finest order. With us the best soils are rich loose loams, good corn ground or rich silicious soils in good tilth. Any location will do except cold, wet low-lands, or river bottoms. They cause mildew. Ground which brings a fine crop of corn will also give a like return in flax, provided the culture be good. One thing must be remembered primarily in the culture of flax, the ground must be clean, free from those pestilent weeds which infest so many farms. It is useless to think of raising flax where weeds have been the principal crop. The ground should be prepared by a preceding hoed crop. Never select a light sandy or weedy soil for flax, but let the soil be fine and clean.

Preceding Crop.—The crop that should precede flax, is potatoes, as it leaves the ground in the best possible condition by keeping it clean, and then leaving it open in the fall, after digging, for the frost to act upon. Corn comes next in the list, turnips is also a good preceding crop. Oats and wheat are sometimes employed, but they do not do so well, as weeds will struggle up, and the ground must be plowed in the fall, which makes more extra work than is necessary, especially where a farmer raises a potato or corn crop. Never use beans or peas as a preceding crop. Flax should always be raised in a rotation, of which I give two examples, viz.: First, rotation of 6 or 7 years; 1st Grass, 2nd Oats, 3rd Wheat, 4th Potatoes, 5th Flax, 6th Clover; second, a rotation of 5 or 6 years; 1st Grass, 2nd Potatoes or Corn, 3rd Flax, 4th Oats, 5th Grass.

Cultivation and Manuring.—The mechanical condition of the soil is perhaps the most important point in this connection. Because when finely pulverized it does not part with the moisture readily, and is perfectly free from stagnant water. Thorough tillage is the secret of successful flax raising. Care in preparation is the rule, which if carefully adhered to, and the season is at all favorable, it is almost impossible to fail. While all crops are benefitted, especially on dry lands, by the ground being broken up in the fall and thrown in ridges, that the frosts of winter may mellow it for the future use of the crop, no crop probably feels it so sensibly as flax, and for the trouble it gives ample return.

Use manure which is thoroughly rotted, and to benefit the immediate crop let it be put on in the fall, then the different ingredients will become diffused in the soil. But be careful,—you may make your soil too strong for flax. If it would get a good crop of oats, you may expect a good yield of flax. When too strong it yields a long, coarse and inferior article. Flax that is grown upon poor land will not give satisfaction, even if manured in the fall and plowed, because it requires the power derived from old manure remaining in the ground; however, this difficulty might be obviated by using a liquid manure which takes immediate effect, but that kind of manure is not always on the farm, unless arrangements have been made for the same.

Flax is the most exhausting crop you can raise, unless it be tobacco. Its demands are great, and no doubt if the proper course were taken it could be made to be equally remunerative as a manure. "The simple rotting of flax for three years in succession on grass land is equal to one good top-dressing of barn-yard manure." Ashes are an excellent manure, wood ashes are preferable to coal. The manure, however, made from linseed cake should never be used on flax ground, as it is deemed injurious—why it is I cannot tell, unless it is too powerful.

Seed and Seed-Time.—In this section we have two varieties of seed from which good fibre is obtained:—"Little-seed" and "Sapling." The Little-seed (the only name I have ever heard for it) brings far the best flax; in fineness it is superior, and for strength is equal to the Sapling; the length is not quite so long, but the quality makes it up. It is bright dark brown, plump and full, gives a fibre of 1 to 1½ yard in length. The Sapling seed is yellowish brown, my neighbors say it has a greenish tint, but I could never see that color in it. I consider this variety as the most valuable for market, both as regards the seed and

fibre; the fibre often times being a yard and a half in length, and as a general thing when sown for that purpose, it is very prolific in seed. The Sapling is a variety best calculated for canvass and cordage, the fibre being much coarser than that raised from the Little Seed, the latter being fine and smooth. In selecting seed to plant be sure it is plump, heavy and the color bright. Good seed is of great importance. It is necessary to change seed occasionally, this may be done by bringing that raised on an inferior, poorer soil, to sow upon a richer and more powerful one.

When shall I sow?—is the question asked by the new beginner. As early as you can—the earlier the better. The old German time is "Good Friday" in the morning—it may be said, sow last of March, till middle of April. It is most generally sown about the first of May, but early sowed flax gives the largest yield; is of a more uniform and finer fibre; is stiffer and less liable to fall; does not suffer from drouth, and grows more thriftily with the increasing warmth of summer. The early sown flax, though it grows slowly at the start, obtains a strong durable fibre, while that of the late, from its rapid growth, is soft and weak in fibre and is much lighter when prepared than the former.

It is necessary to sow evenly if you wish a uniform crop. You can sow it in the same manner you do wheat or other cereals. If a coarse fibre is wanted, or the seed only, sow thin, from three pecks to a bushel. For fine fibre sow from one and a half bushels to two and a half, or three bushels. Flax that is sown too thin will have thick stalks, while that which is too thick will be short and unsatisfactory. There are several ways to cover the seed after it is sown, viz., by the thorn or crab bush, by the harrow, the roller, and by letting the rain do it. The first, the one which I consider the best, as it covers the seed about the right depth, is done by taking a thorn or crab bough and sweeping the ground over. The second does middling well, but covers too deep; it is the easiest way, and suits the lazy man. The third makes heavy soil too compact, hard, and the plant seems to struggle hard to get along and looks sickly; it may do very well in an extra loose soil. The last is one of nature's plans of planting and does well, but it cannot always be relied on. The first is the most reliable and seems to be the nearest the wants of the plant, and for that reason may be considered the best.

Enemies.—The cut worm is the only enemy I know or ever heard of—when it attacks the young plants they never do anything afterwards, for they never throw out new shoots or sprouts. This alone is a very great objection to planting on sod, as some of our farmers do—it should never be done. Flax is not attacked by birds of any kind to my knowledge, it may be on account of the hardness of the seed-bolls and the lightness of the haulm. The plant is sometimes injured by rust which destroys its value for fibre; in this case it is only valuable for its seed.

Weeding.—This is something that need never be done if the culture of the preceding crop has been thorough, unless it should be in new ground, and then, with proper care in raising previous crops, it would be unnecessary. It may however be well enough to state how to do the weeding, if a novice should have occasion for that ever to be detested job. If the flax is weedy, when about six to nine inches high, you should pass through it with your bare feet, so that you will not destroy the young plants, and pass in a straight line across it, weeding clean as you go and continue thus until the job is done.

Signs of Ripeness—Gathering and Drying.—The signs of ripeness with flax are as perceptible as that of wheat, rye, or other grain. The haulms or stalks of flax become clean, the lower leaves falling off half way up, and its color turns from greenish to yellow, the seed bolls turn a little yellow and hard. When wanted for seed it should be allowed to become fully ripe.

Pulling must always be considered the best plan of harvesting flax, on account of the fibre, which is taken from the root, it being equal if not better than fibre taken from other parts of the plant. You should make each handful a sheaf, and it should be shocked like wheat, with as many sheaves as you please in the shock, but without any headers, and left to cure from six to eight days; in rainy unfavorable weather, several weeks. By this course, the flax is kept straight, and nicer than by any other course, with less trouble. Some harvest flax by cutting with the cradle, this is very injurious to the fibre as much of the fibre is lost in the root, and the part left on the field; if the seed only is wanted, then it is proper. In gathering you should be careful to assort it, as in the same field you will always find flax of different lengths—put the short by itself and the long in like manner, that of an inferior quality being placed along with the short. This care at first will save much trouble subsequently. After it is dried or cured in the field, it should be taken in and placed away in the shed or barn like wheat or other grain, to remain until threshed.

Beating off and Preserving the Seed.—When the flax has become perfectly dry the seed is immediately beaten off—(unless it is not intended to rot until the following year.) The flax is often laid down like grain, two dozen bundles at a time, and threshed with flail. This method I do not approve of, on account of the injury it does to the fibre, although it is the quickest way to get along with it. The better plan is to take a barrel, then

take a sheaf at a time and beat off the seed-capsules over the edge of the barrel, which will thresh it clean, and in the end may be about as quick as any plan. If a barrel is not at hand, just turn a plow upside down and beat it out over the mould board; or fix up a rail and beat it over that, which will answer the same purpose. These latter modes are the best, as the fibre is not so much broken, and they can be done with very great ease. Threshing should always be done in the barn, on a smooth floor, where you can use a fanning mill.

You can put the seed away in barrels, after cleaning, until wanted for use or market, if in barrels it should be occasionally removed from one to the other, this will keep it from becoming compressed and assist in evaporation; like wheat during the summer, moving it does it good. It is said that the seed-capsules, soaked in hot water, are good for cattle—I have never tried it; but the seed itself, fed in small quantities to animals of any kind, is good.

Rotting.—The time for rotting flax is from last of August till the middle of September. It is spread out in straight rows in the meadow, there to remain for some four weeks, if there is no rain, in rainy weather three weeks will be sufficient. Turn it about once a week. To tell when it is rotted enough the following rules are a guide.

1. When the flax splits at the forks or joints on which the seed bolls are.

2. When the woody stock has become brittle, so that it breaks like glass, with a peculiar sound, if it bends and you can wrap the stock around your finger without breaking it is not rotted enough.

3. If you take a stalk when damp, and wrap it in a little round ball, and throw it into the water and it sinks, then the flax is rotted.

After it is rotted it is then bound up in sheaves (similar to those made at first) ready for

Breaking.—This is a branch in the culture of flax that can be done away with in a great measure when you are near to market, or within reach of flax-dressers—as they will buy it in straw, and in many instances prefer to do so. In this section they give for straw, when it is rotted, $15 to $18 per ton for cut, and $28 to $45 per ton for pulled. At these figures the farmers will be remunerated, and much tedious labor saved, unless they have labor saving machinery on the farm for that purpose. However, when it is the intention to break the flax at home, it may be done in the following way. Take a handful in the left hand, and with the right hand take hold of the handle of the breaker and raise it up, and place the flax across the lower knives, and then bring the upper knives down upon it, with right hand, continuing the operation until the flax is broke one half its length, then turn it, wrapping the flax that is broke around the fingers of the left hand, repeating the same operation till broke, when you take it out and give it a switch or two in the air for the purpose of taking out the shoves, (or pieces of straw,) after which it is twisted to keep it from tangling.

If your flax is not sufficiently rotted you should "fire" it, that it may break easier. This is done by digging a place at the side of a hill, so as to give you a kind of back wall, and then, placing a rack over the same, about four feet high, and spreading the flax thinly over the top, it becomes well dried or fired as it is called. Another mode is to dig an underground flue about fifteen feet long—it is not used with us—it works well and is less liable to burn the flax. In firing be careful that you don't make the fire too big. Some farmers fire all their flax, but it is unnecessary, and need only be done when the flax is in the condition spoken of above. Labor-saving machinery is becoming so plenty that the hard labor of the past in flax culture can readily be done away with. Several flax breaking machines have been patented, and are, I believe, within the reach of many. These supply a long-felt want, and will prove advantageous. These machines are made of different sizes to suit small as well as large operators. It is hoped this machine may do for flax and hemp, what the gin has for cotton.

Scutching.—Is done by having a board placed perpendicular in the ground, the top of which is square, it being about 6 to 10 inches wide, and in connection with the same, a wooden scutching-knife. Take knife in your right hand, and a handful of broken flax in the left hand, which lay across the board, commence to scutch, by striking the flax close to the board with the knife in your right hand, and so continue till all the scutching tow and shoves are out. If the crop or seed bolls are thick in the lint, and will not break off, you should use the hackel. The tow which remains among the long fibre is taken out with the hackel. Another mode of scutching is with a scutching mill, but it does not do the work as thoroughly as it should be done. It may be dressed on it first and finished in the manner spoken of above.

THIRD-PRIZE ESSAYS.—No. 18.—BY HUGH McKEE,

NORWICHVILLE, CANADA WEST. (Extracts.)

Soil and Rotation.—By careful cultivation, almost all of our soils will produce good flax, but some are particularly adapted to it. The best is a naturally dry, or properly drained, deep clay loam with a clay subsoil. It is very important that the land be drained and subsoiled, as, when it is saturated with either surface or underground water, good flax cannot be expected. The land should be in the finest, deepest and cleanest state, as the roots of the flax will often penetrate to a depth in the ground equal to half its hight above it. Flax prefers a rich soil, but any soil that will produce good corn or oats, will produce good flax, and it may follow either of them, or it may be sown on a clover sod. Flax should not be grown on the same ground more frequently than once in 5 or 7 years. In Ireland, where more flax is grown than in almost any other country, once in 10 years is common practice. The land for flax should not be manured the year the flax is grown; if it needs manure it should be applied to the previous crop, so as to get thoroughly rotted and mixed with the soil. Manure applied directly to the flax produces a rank and uneven growth. Thorough cleansing the land from weeds, and a thorough preparing of the ground is most important. If sown on stubble land, the field should be harrowed soon after harvest, so as to cover all seeds of weeds that may be on the land, so as to make them sprout; all land that is intended for flax should be plowed late in the fall and left in as rough a state as possible, for the action of the frost, by which it is crumbled down finely. In the spring it is better to cultivate with a gang plow or two wheeled cultivator than to plow, in order to avoid the turning under the fine surface mould, which is so necessary for the flax seed. This cultivation should be done as soon as the land can be worked in the spring, so as to cause weed-seeds to germinate, and it should lie a few days before sowing. When ready to sow, drag with a heavy harrow, so as to pulverize the soil, and kill any weeds that may have started; then roll with a heavy roller; then sow, and harrow in the seed. In harrowing in the seed use only a light harrow so as not to cover the seed too deep, for if covered more than half an inch, two chances to one it does not come up. The land should be then rolled again so as to leave the surface smooth and level. Care should be taken not to roll when the ground is so wet as to adhere to the roller; nor, indeed, to work the soil at all.

Seed and Sowing.—The best seed for sowing when the flax is grown for the fibre is Riga, but as that is expensive and difficult to get, good American seed should be used, that of good quality is very oily when broken, smooth and slippery, and will sink in water. The quantity sown will depend on the object of the grower, and the condition and quality of the land. If grown for the seed three pecks is sufficient. Thin sowing causes the plant to branch out, and bear abundance of seed, but the flax is very coarse and of an inferior quality; the richer the land the less seed is required, as it will branch more. But if fibre is required, from two to three bushels should be sown (on rich soils, three bushels, on poor, two). It is better to sow too thick than too thin, for if sown thick, the stems grow straight and tall, and produce but 2 or 3 seed bolls, and the fibre is superior in length and fineness, to that produced by thin sowing, which grows coarse, branches out, and produces an inferior quality of fibre. Great care should be taken to get clean seed. In the old country, the crop is weeded by hand, but that would be too expensive in this country, where the price of labor is high, therefore the cleanest land and cleanest seed should be selected. If any rank weeds start they should be carefully pulled. The time of sowing will vary with different localities, the favorite time in Canada is the latter end of April and the first week in May. It should be sown as early in April as the weather will permit, but not before the soil is dry and warm. The seed is sown broadcast, and care is necessary to sow it evenly, some recommend to go over the ground twice, sowing half the quantity each time. For fine fibre early sowing is indespensable, vegetation is very rapid in the later part of the season, and there is nothing like steady growth for securing good quality in the crop. After sowing, which requires much skill, as the seed is very slippery and very apt to be sown unevenly, cover it with a light seed harrow, going once lengthwise of the land, and then across, as it will then get more evenly spread, and the small drills left by the teeth if harrowed but one way, will be avoided. The ridges should be little, if any, raised in the centre, when the seed is sown, or the flax will not ripen evenly. There should be no ridges when the land is thorougly drained. The most critical time in growth of the flax, is before it is up sufficiently to cover the ground; a heavy frost or scalding sun might then cause great damage. The plant flowers about the

middle of June; and the field with its light blue flowers, at that time, is a very beautiful sight.

Pulling.—If the flax is grown entirely for the seed, it should be allowed to get ripe, but not ripe enough to shell; it can then be cut with a scythe, or reaping machine the same as any other grain crop. If grown for the fibre, experience has shown that it should be pulled before fully ripe, and it is a nice point to determine the right time. If pulled too soon, the fibre is finer, but loses too much in weight; if it gets too ripe, the fibre loses in quality. The best time is when the seeds begin to change from a green to a pale brown, and the stalks change to a yellow for about two thirds of their length above the ground. If any of the flax is lying down from any cause, and suffering from wet, it should be pulled as soon as possible, and kept by itself.

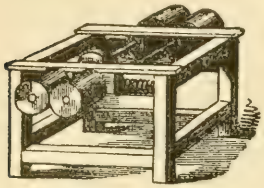
When the flax is in the right state for pulling, it should be pulled as rapidly as possible, which is done by the puller taking hold of a small quantity near the top as it stands, and carefully pulling it up and keeping the root ends even; when pulling, all weeds should be thrown out. If the ground is not underdrained, and not level when it is sown, the flax will be found of various lengths. In such cases pull the different lengths each by itself, and keep them separate, in all future operations. This can be effected by grasping the flax immediately under the bolls, this allows the under, or shorter stalks to remain, which can be got by a second pulling; if the latter be few, it would be better to let them remain, as the loss from mixture and discoloration of the weeds which will be pulled with it, would make the profit very small. If the land has been drained, and leveled, the flax will be nearly all of a length. It is very necessary to keep the flax even, like a brush, at the root ends. This increases the value to the manufacturer, and of course to the grower, who will be amply repaid by a higher price for all his additional time or trouble. The handfuls of flax, as they are pulled, should be laid on the ground by themselves, or two or three across each other, taking care to keep the but ends even.

Three methods may now be adopted for its future management, viz.: 1st, Rippling immediately after pulling, and steeping at once. This is the general way in Ireland. 2nd, It may be dried in stooks of a peculiar structure, the seeds taken off at leisure, and either steeped, or dew rotted when convenient, this is the plan generally adopted in this country. 3rd, The flax may be sold in the field, or after it is pulled.

1st Method.—The flax should be rippled as soon as pulled, and this should be done in the same field with the pulling. The rippling comb consists of a row of iron teeth, screwed into a block of wood. The best have half inch square pointed teeth of iron, set with the edges approaching, $^{3}|_{16}$ of an inch apart at the bottom, and half an inch at the top. They are 18 inches long, to give sufficient spring to prevent breaking the flax. The points begin to taper three inches from the top. It should be taken to the field and screwed upon a plank, 9 feet long, and placed on two stools. The ripplers may either sit astride or stand on opposite sides of the plank. A winnowing sheet must be placed under them to catch the bolls as they are rippled off. The flax can often be rippled by drawing but once through the comb. The sheaves of flax are laid at the right hand of the rippler; he takes up one handful at a time, and spreads out the tops, so as to give a wide surface to the teeth, and draws it through. If the bolls are thick, two drawings may be required. Four men with two ripples will ripple more than an acre a day. The rippler lays down the handful at his left side, which should be then bound up in sheaves, called "beets." The bolls should be winnowed, to blow all the chaff and long straw that may be in them, and then thoroughly dried, either on the barn floor, or on the winnowing sheets out doors, they should be turned twice a day until dry. When they may either be sold to to the Oil Mill, or kept for feed. Flax treated in this first method should be rippled as soon as pulled, and carried to the water as soon as possible; it should not be allowed to stand in the field, if avoidable, even the second day, that the straw may not harden. Although this method of treatment will produce a better quality of fibre than any other, it will hardly be adopted, as it makes considerable labor in the season when labor is high and scarce.

2nd Method.—The flax as pulled, should be bound near the tops, in loose bundles, about one half larger than a man can hold in one hand, say about 4 inches in diameter, and gathered into shocks, with the root ends spread well out, that it may become thoroughly dry, which will take from 6 to 8 days. If it is not thoroughly dried, it will be apt to mould and spoil. When it is dry, it may either be stacked so that the rain will not penetrate, or taken to the barn, and allowed to remain until after harvest, when the seed is taken off, and it is either dew or water-rotted during the fall. The seed may be taken off during the winter, and the rotting take place the following spring or summer. It may remain 2 or 3 years, if kept dry, and free from mice. Various means are employed to remove the seed; some using the rippler already described; some, what is called a beetle, which is a block of wood about 10 inches long, and 3 or 4 square, into which a handle is inserted, though frequently the handle is a prolongation at an angle of the head, made small enough for the hands to grasp, by such an

instrument the seed can be beaten out. A more expeditious way is, to pass the seed ends through rollers, driven by horse or other power, as described on page 76 of the *American Agriculturist*, for 1863, and illustrated by fig. 29. Seed taken off in this way, after the straw has been thoroughly dried, does not require to be spread out to dry, but simply to be winnowed like any other grain, to remove the chaff.



29.—ROLLER FLAX-THRESHER.

3rd Method.—It is beginning to be the custom where flax-mills are erected, for the proprietor of the mill to purchase the flax standing on the ground when in flower, or after it is pulled and stacked, either before or after the seed-bolls are taken off; this I think will be found to pay both parties the best, as the manufacturer will then have skilled persons to take charge of it, and can produce a more uniform and better quality of fibre, than each farmer can by rotting his own.

A system something like this is carried on in Belgium, which involves a division of labor, and no doubt contributes, in a great measure, to the excellence of the flax produced in that country. The farmer has thus but to produce the crop in the utmost perfection that good culture, soil and season will admit of. The flax-dresser's attention is then exclusively devoted to its after-management, and the laborers employed by him soon become expert, each in his particular branch of business.

ROTTING.—The rotting process is the same for flax, treated either in the 1st or 2nd methods. If a stem of flax be examined, it will be found to consist of three parts, 1st, a woody, central, hollow stem in the center, called the "shove" or "boon"; 2nd, a tubular sheath surrounding the shove, composed of long and firm cells, this is the fibre, and 3rd, a delicate covering of skin or bark. To separate the fibre from the worthless parts connected with it, is the next step.

Dew Rotting.—As soon after harvest as possible, the rippled straw is taken to a smooth meadow, or clean pasture field, and spread out carefully in swaths, about half an inch thick. The swaths should be several inches apart so as not to get tangled in turning, and be careful to keep the straw straight and even. The length of time it will have to remain, will depend upon the state of the weather: if warm and showery, it will not take so long as it will if the weather is dry or cold; the period may be shortened by turning it; the turning is easily and quickly performed with a smooth pole about 10 feet long, as in figure 30. From 4 to 6 weeks will be required for rotting it, and it should be turned 2 to 4 times: though some recommend to let it lie until one side is done, and it will then require but one turning; but I think several turnings better. When the flax takes on a silver gray color, and the fibre begins to separate from the woody part, especially at the ends; or when on breaking a handful of the straws, or on twisting them, the woody part comes freely out, and leaves the lint or fibre clear, it is ready to be taken up. In taking it up, keep the straw straight and even,

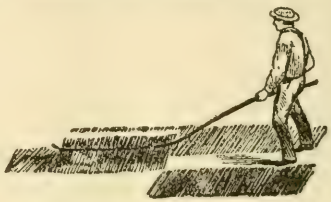


Fig. 30.—TURNING THE SWATHS.

and bind in moderate-sized sheaves. If not thoroughly dry, set them on their ends until they are so. It is now ready for the brake and scutch mill, or it may be stored under thatched stacks, or under cover until otherwise disposed of.

Watering or Steeping.—This is a process by which the vegetable matter connecting the stem and fibre is decomposed by fermentation under water. The value of the fibre depends very much on the care bestowed on this process. The steeping pond should be made about 4 or 6 yards long, 2 to 4 broad, and from 3 to 4 feet deep. River water is the best; a small stream of water allowed to run through the pond will very much improve the fibre in color. Care should be taken to avoid using water containing minerals, as it will discolor the fibre. The flax, after rippling, is brought to the pool, in which it is placed in rows, one beet or sheaf deep, at an angle of 45 degrees, the bands of each succeeding row reaching between the root ends and bands of the last; straw is then spread over it, to protect it from the sun, and boards laid on, and weights are placed on them so as to sink the flax from 4 to 6 inches under the surface of the water. It should be kept from the time it is put in until it is taken out at that depth, but great care should be taken not to sink the flax so as to touch the bottom, which should not occur. Additional weights are required when fermentation commences, to be taken off when it subsides. When the fermentation subsides, it should be carefully watched to ascertain when it is fit for removal. This is one of the most critical stages, and on it the profit or loss may turn. It will require on an average from 5 to 15 days to get sufficiently steeped, this will depend very much on the heat of the weather and

the nature of the water. The best test that I know of to tell when it should be taken out is, to try some stalks of an average thickness, by breaking the stem in two places, about 6 or 8 inches apart, at the middle of the stem; catch the broken bit of wood or shove, and if it will freely pull out downward, for that length, without breaking or tearing the fibre, and with none of the fibre adhering to it, it is ready to take out. Make this trial every 6 or 8 hours after fermentation subsides, for sometimes the change is very rapid. It is, however, more frequently under, than over watered. Every grower should learn to know when the flax has had enough of the water, as a few hours too much may injure it. If it is found, after taking it out of the pond, that it has not remained long enough, the error may in a great measure be rectified, by allowing it to remain longer on the grass.

Never lift the flax roughly from the pool, with a fork, it should be done by men standing in the water, who hand it to others, ready to receive it, on the bank. The steep water can either be used as liquid manure for meadows, or kept in the pool till the next flood,—it should not be run off into the river or creek when the water is low, as the odor is very unpleasant, and the water thus impregnated, is poisonous to fish. (It is contrary to law in Canada). It is much nicer handling if the flax bundles are placed on their root ends, to drain for 12 hours or more, before they are removed for spreading, it should not be piled in heaps, as it is very apt to heat and spoil.

Spreading.—Select when possible, clean, short, pasture ground, or a newly mown meadow, lay the flax evenly on the grass, and spread thin and very equally. If it has been properly rippled, the handful will come readily asunder, without entangling. From 4 to 8 days, if the weather is damp, or from 8 to 12 if it is dry, should be sufficient time for it to lie on the grass. A good test of its being ready to lift, is to rub a few stalks from top to bottom, and it is ready to lift if the woody part breaks easily, and comes from the fibre, leaving it sound. Also when a large portion of the stalks are found to form a bow and string, the fibre contracting and separating from the woody stalk. But the most certain way is to try a small quantity in a flax mill. Some recommend turning it while on the grass, (as described in dew rotting) but it will not require it if it is evenly and thinly spread.

Lifting.—When lifting, keep the flax even at the ends, so as to avoid loss in scutching. During all these operations the different qualities and lengths should be kept separate, as a mixture would lessen its value. It should not be lifted when the straw is damp. When it is lifted it should be bound up in bundles, and set on their root ends for a few hours to thoroughly dry. It is now ready to be sent to the scutch mill, though it would be much improved by being put up in small stacks, loosely built, and set up on capped posts, to prevent injury from rats or mice, and to allow free circulation of air.

Some objections may be made to the steeping, on account of its tainting the water, and the air, and possibly, those unacquainted with it may think that the smell, which is disagreeable, may be unhealthy, but it has never been found so, either in France, Belgium, or Ireland, and no healthier women can be seen than those employed during the whole flax season in pulling, spreading and lifting it.

The trouble which flax entails in the various processes which it has to be put through, before it is ready for the market, is often objected to. This will not be considered of weight, by the careful and enterprising, when it is found that the profits increase in proportion to the care and skill used in the different stages of its management.

Dressing.—Among the many new methods brought forward in the Old Country, for the preparation of flax, that of Mr. Watt, is perhaps the most prominent. Since its first introduction, it has made rapid progress, though perhaps its merits have not yet been sufficiently tested. The steeping of the flax is effected by the agency of steam, which disunites its cementing materials, thus dispensing with fermentation.

It may be briefly described as follows: The flax straw is delivered at the works, in a dry state, either with the seed on or off, if the seed is on, it is taken off by metal rollers. The straw is then placed in close chambers, having two doors, which is for taking in and discharging the flax, the top is of cast iron, and serves the double purpose of a top and steam condenser, the straw is then laid upon a false bottom of perforated iron, the doors are closed, and made tight by screws. Steam is driven in by a pipe round the chamber, and under the bottom, and penetrating the mass at first removes certain volatile oils, contained in the plant, and then is condensed on the bottom of the iron cover, and descending in a continuous shower of condensed water, saturates the straw, forming a decoction of the extractive matters which connect the fibrous and non-fibrous portions of the plant. The liquid is drawn off from time to time, and the more concentrated portions used with the chaff, (and light seed) for feeding cattle and pigs. The process is shortened by using a pump, or some arrangement, that will repeatedly wash the mass, with the water allowed to accumulate. In from 8 to 12 hours, varying with the nature of the straw, it is removed from the chamber, and having been deprived of all its extractive matter, without decomposition, it is

passed through large iron rollers, for the purpose of removing the epidermis, or outer skin of the plant, and for the purpose of discharging the greater part of the water contained in the saturated straw, and while in the wet state splitting it up longitudinally. The straw being free of all products of decomposition, is then easily dried, and is in a few hours ready for scutching. The invention of Mr. Watt has a two fold object, first, to obviate the objectionable process of rotting, and secondly, to work up the bolls and refuse of the plant into cattle food. Of the process of steeping in water, spreading on grass, lifting and drying, we need say but little to those engaged in it, it being from the first to the last disagreeable, at every stage of the process. The manual labor is filthy in the extreme, while if the steep ponds are allowed to run into rivers or creeks, these will be so polluted, as not only to destroy fish, but to be unfit to be used by cattle.

Flax, after drying, is improved by stacking, technically speaking, it "comes." Temporary sheds answer every purpose, if the roofs be tight.

Dressing is the next operation in order. It is by manual labor that nearly all the flax in Belgium, Holland, etc., is dressed, formerly in Ireland, it also was the case, but now improved machinery is used. It is evident that to make flax pay in this country, machinery must be used in the preparation of the fibre for market. Flax will not pay to be dressed by hand in America. There are improved machines made now, which can be got at a very reasonable price, for scutching straw. The one most in use in Canada, is one patented by Mr. Rowan, of Belfast, Ireland. It can be used by any person, and I believe comes nearer to the requirements of the flax grower than almost any other; any person, although he may never have handled flax before, will find no difficulty in using this one. A single machine, requiring the attendance of one person, and a double machine, worked by two persons, which do not occupy a space of more than 3 by 5 feet on the ground, and which may be attached to any horse power in common use, have proved profitable. This machine will deliver twenty pounds of scutched flax per hour, for each hand. The yield of clean fibre is greater than if hand scutched. Another machine which I have not seen, but one that is highly recommended, is manufactured and sold by a prominent house in New York.

It consists of a series of fluted iron rollers, between which the flax is drawn from the feeding board, a peculiar motion is given to the rollers by the gearing, which causes the flax to pass repeatedly back and forth between the rollers, and it comes out with the boon or shove so thoroughly broken, that a large part of it can be shaken out of the fibre, without any farther dressing. This machine, as well as the one first described, is portable, and can be driven by any common horse power. Any person who can run a threshing machine or fanning mill, can run either of these machines. The saving of fibre in both of these machines are about the same.

Other machines are in use in some flax districts, but they require more power, with experienced workmen to drive them, they leave a greater percentage of shove in the fibre, and there is considerable danger in working them.

The most common kind of a hard brake, consists of two sparred frames. * * * [Description omitted. See 1st prize essay, Ed.] * * * The flax is shifted until all the stems are broken, and then it must be scutched to remove the shove or broken woody parts from the fibre. Hand scutching is still a common practice in some parts of the country, but it is tedious, and the time it takes makes it expensive. [Description omitted.]

In the scutching mill, several wheels are fixed on a shaft, distant from each other 3 feet or more. The scutching blades of hard wood or metal are attached to, on the rim of these wheels, upright pieces of metal, called stocks, and so placed, that the blades as they revolve, pass near their surfaces, the tops of these being on a level with the shaft. The blades are from 6 to 7 eighths of an inch from the stock at the striking point, and 4 to 5 eighths at the heel. The wheels are 3 feet 6 inches in diameter, and make from 200 to 250 revolutions per minute, and are covered to prevent dust or accident.

After flax is broken, it is "stricked," that is, made into "stricks," for the scutchers, a strick is as much flax as one can grasp in one hand, evenly arranged and slightly twisted. A large percentage of tow is made in scutching. Flax when scutched, should be sorted into qualities, each determined by the judgement of the workmen. It is commonly made up into bundles of 14 pounds each, the sorter laying the stricks lengthwise over 3 bands, with which the bundle is bound.

Another method is to give the strick a twist and double it together, and then to pass a band round their twisted ends, making them ready for bagging. The bales generally weigh 200 lbs., being 16 bundles of 14 pounds each. Flax has now been brought to that state in which it is ready for spinning or the market. It should be stored in a dark, cool place; if kept too dry, it loses in weight and quality. It is much improved by being stored a few weeks. A ground floor is more suitable than a dry or airy loft, but it should not be allowed to get damp.

The manufacture of flax cotton is a subject of great importance. It consists in producing

from the coarse kind of flax and the roughest kind of tow, a material resembling cotton, fit for spinning or using as batting. Flax intended for this use can be cut with a scythe or mowing machine, and treated in all respects the same as hay. Flax that is grown for the seed can also be used for this purpose. The straw may be threshed in an ordinary threshing machine. The tedious rotting process is not required in making flax cotton.

In Belgium, "stricked" flax is made from the best Riga seed, sown five bushels to the acre, on land most carefully cultivated and enriched. Forked stakes are driven into the ground, forming squares, poles are laid on these 8 or 10 inches above the ground, and upon these a netting, well secured, is stretched. The flax grows high and slender, and is supported by the poles until it matures. As soon as the seed begins to form, it is pulled, set on ends in circles, and dried without much exposure. Great care and attention are paid in watering and scutching it. Flax treated in this manner is worth, in its green state, from $300 to $350 per acre, and when scutched, from $1,200 to $1,500 per ton, and its value is greatly increased when manufactured into the finest Brussels lace.

THIRD-PRIZE ESSAYS.—No. 19.—BY JAMES BAKER,

HOOSICK FALLS, RENSSELAER CO., N. Y.

KIND OF SOIL.—Nearly all moderately fertile soils will produce flax, but a clay loam, the loam predominating, is the very best soil, as that gives the largest quantity, and the best quality of fibre or "lint," as it is generally called. A sandy loam and clear loam are the next best, sand and gravel being the poorest soils, although in very cool moist seasons, good crops may be raised on such soils. A moderately rich clay loam is very sure in any season, whereas on dry soils it is often a failure in dry times. Slaty soils produce an excellent quality of flax in moist, cool seasons. As a general thing, any soil that will produce good barley, will give good flax, except on very low land, where it is liable to rust, which injures both lint and seed. Although poor or worn out soils will not produce flax, still it is not advisable to sow it on land that has been made exceedingly fertile by recent application of manure, as it is liable to fall down and rot, causing great loss and sometimes a total loss of the whole crop, and for this reason, always take off some other crop after making an application of manure, before sowing to flax. Applying manure to flax also causes weeds to grow up in the flax, choking the crop, and making bad pulling. Land should be as free from weeds as possible, consequently, flax should be sown on land devoted to some hoed crop the previous year, or it may be sown on pea stubble, as that is generally clear from weeds. Good crops may be raised on wheat stubble, if the land is moderately rich. Never sow flax on land infested with Canada thistles, as it costs more to pull it, than the crops are worth, if the thistles are plenty. A weed called spurry or joint weed should also be avoided, as it causes great waste, one stalk sometimes spoiling a foot square. Flax requires a cool, moist soil, or a cool wet season to bring it to the greatest perfection, therefore, on farms, much affected by drouth, it should be sown on the most moist part, and on lands not badly affected by dry weather, it may be sown on the dryer portions if desirable. It should not be sown on the same piece of land oftener than once in five years; neither on sward land, as the yield and quality is generally very poor, and the same land without any manure, will raise better flax after taking off a crop of corn or potatoes, than if sown on the sward. Land for flax should be plowed very fine, the plowman being careful to cut it all up, and pulverize it as much as possible. As soon as plowed, level down with the harrow, and it is ready for sowing.

THE TIME OF SOWING varies in different latitudes, and in different places in the same latitude, consequently no definite directions can be given, but every one must be governed by the circumstances by which he is surrounded. When just coming out of the ground it is quite easily killed by frost, and should not be sown until there is a probability that all danger is past, and the sooner after that the better, as like some other crops, the earliest sown produces the heaviest yields of both lint and seed. In Rensselaer and Washington Counties, the two greatest flax-raising counties in New-York, the usual time of sowing is from the 25th of April to the 10th of May, according to the season.

THE QUANTITY OF SEED.—Depends upon the object in view. If raised expressly for the seed, 24 to 28 quarts is sufficient, and if wholly for the lint, 5 to 6 pecks should be sown, but if lint and seed are both desired, one bushel is considered the best quantity. Very rich soils require less seed than lighter land, therefore, on light soils, from 34 quarts to 5 pecks should be sown. If a very fine, nice lint is desired, sow very thick. If both seed and lint, sow about one bushel, varying a little according to the soil.

SOWING THE SEED.—The sowing is best done

with the broadcast seed sower, but as every farmer does not have one, such must sow by hand. In sowing by hand, it is better to sow the land twice over, which gives a more uniform seeding, than can possibly be obtained with once sowing. Take half the quantity of seed and sow once over, sowing the same as hay seed, then cross sow with the remainder. The last time over will generally cover all places, not sown the first time over. Any one familiar with sowing hay seed can sow flax seed. After sowing, harrow thoroughly once over, and roll down. More harrowing injures the crop. In case the weather should become wet after sowing and before harrowing, and should continue until the seed had sprouted, the ground should not be disturbed at all. Excellent crops have been raised that were not harrowed in, but it is better to harrow. When the flax is about an inch high sow one bushel each of ashes and plaster to the acre, or if the land is wormy, double the quantity of ashes without the plaster. Should there be any mustard, yellow seed, or Canada thistles, pull them out as soon as they show themselves above the flax, which is all that is necessary to be done until

Pulling.—This is the most laborious part of flax raising, the more so, as no mechanical apparatus has as yet been invented to perform that part of the work in a satisfactory manner. Three different machines have been invented, with which to pull flax, but as all were failures from one cause or another, it is useless to describe them here. The only method of pulling flax, and keeping it in suitable shape for dressing, is by hand, and the more care there is used in handling, the greater will be the profits. Much, also depends upon the state of the flax when pulled. It is conceded by all flax raisers, that the yield is greatest if pulled just as the bolls have turned a brown color, the lint and seed both being heavier then, than at any other time, but as pulling is a slow operation, it follows that it must be commenced before it arrives at that state, as loss may ensue. The time of commencing must be determined by circumstances. A farmer having but little flax and plenty of help may defer pulling until it is in the best state for pulling, whereas, one having a large quantity must commence earlier. The rule among old people used to be, when the leaves had fallen from the stem half way up from the bottom, but where large quantities are sowed, it must be commenced sooner, otherwise, there will be loss before it can all be pulled. There is less loss of fibre sustained in pulling it green, than by leaving it until dead ripe. When allowed to get very ripe, the bolls fall off in pulling, and the lint becomes brittle, causing it to whip away in dressing. Every day that flax stands after ripening, diminishes its value five per cent.; but it may be pulled as soon as the bolls have turned from green to yellow, with but little loss, if properly taken care of after pulling. When pulled green, it should be tied in small handfuls, say three or four inches in diameter, lest it mould in the center of the bundle. Neither should it be pulled when wet; but after the flax has ripened it may be kept in a little larger bundles, and may be pulled at any time, wet or dry, as it will dry out if kept set up. In order to make flax a profitable crop, three rules must be observed in pulling, viz., to pull it clean, to keep the straw straight in the bundles, and to keep the roots even. In pulling, stand with the back down the hill, so as to avoid stooping as much as possible, and turn the right side to the flax, and with the right hand strike around what flax there is on four or five inches square, at the same time taking hold of it with the left, and drawing it quickly from the ground with both hands, move it quickly to the side of the standing flax. Still holding it with the left hand and keeping the buts on the ground, with the right hand gather another handful, bring that and the one previously pulled together, and pull as before. So continue to do until enough has been pulled to make a bundle. Then it should be taken loosely in both hands, and shocked on the ground, two or three times to even the buts. Then hold it with the left hand, and with the right pass around the middle of the bundle about a dozen stems of flax, holding the ends together and whirling the bundle until the band is twisted sufficiently to hold. As it is pulled, throw into bunches of six or eight bundles to facilitate setting up, which should be done every night. Make what are called long shocks, that is, bundles set two and two; as it dries much quicker and nicer, than when set up in round shocks. This is done by setting the buts about two feet asunder, and pressing the tops together as compactly as possible, then two more on each end, leaning them a little towards the two first set up, never setting more than eight in a shock. Should any of them get blown or fall down, they should be set up immediately, as flax moulds very soon if left lying on the ground when wet.

As soon as the bolls have all turned a brown color, and the stem has become dry, it should be drawn in. The best way of handling, is to bind each shock into a bundle, either with rye straw or flax, as it is then more expeditious handling, and wastes less seed than if handled without binding. As soon as one load is dry, it should be taken in, as rains injure it very much after it is cured, making it rot unevenly, and causiug also a waste of seed.

Flax seed may be threshed by hand or by rollers moved by power of some kind. Thresh-

ing by hand or "whipping," is a simple, but laborious operation. A large flat stone is placed on the barn floor, at an angle of about forty-five degrees, and the operator standing behind it, grasps the bundle near the root end, striking the heads upon the stone, turning the bundle in his hands while whipping. Four to six blows are usually sufficient if the flax is dry. If set out in the sun a few hours, the labor is diminished. As fast as it is whipped it should be bound up into large bundles again for convenience in drawing to the field for spreading. The same bands with which it was bound before will do for this purpose. The power machine (see fig. 29) consists of four cast iron rollers, fourteen to eighteen inches long, and about nine in diameter, fastened one on each end of two iron shafts, about four feet in length, and set in cast iron boxes, in a strong wooden frame. One shaft has a driving pulley in the centre for the belt or rope, and the other is placed in movable boxes against which half of a common steel wagon-spring presses. This spring is pretty strong, and the middle of it bears against one of the cross pieces of the frame. The rollers when not in use are close together, the spring keeping them in that position, but allowing them to separate when anything comes between them. They may be driven by horse or water power, two horses being sufficient.

Five or six men are necessary to work well, one at each end of the rollers, to feed, and two to hand the bundles, and one to rebind and throw them out of the barn. The feeders stand at the ends of the rolls, taking hold of the buts of the bundles, and drop the heads of the bundles down between the rollers, taking care not to put them in any farther than is necessary to mash all the bolls. Passing four or five times through, more or less, will usually mash off all the bolls. A full set of hands will thresh twelve hundred shocks, of eight bundles each, in a day. After a quantity has been threshed, it should be drawn upon a smooth piece of meadow for

Spreading.—In spreading, begin at the highest part of the field, and drop the handfuls about three feet apart, the buts from you, and up the hill. When a row is dropped across, commence and spread back, taking care to keep the buts even. Take a common jack-knife in the right hand, to cut the bands; then take a bundle in the left hand, cut the band, and, with both hands, spread the flax out evenly over the space between the two bundles, and the rest in the same manner. One quarter of an inch is as thick as it should be spread. Care should be taken to spread it as evenly as possible, so that it may rot uniformly. When one swath is spread, another may be dropped. When it has become thoroughly weathered, which will require from two to four weeks, according to the weather, it should be turned over. This is done by taking a light, smooth pole, about fifteen feet in length, and, beginning at one end of the swath, run it under the flax, near the top, and turning it bottom side up. The pole should be pressed down on it after turning, to prevent the wind from disturbing it. When a wisp of it, as large as a man's finger, can be taken in the hands, and a portion of it, bent backwards and forwards a few times, will break the shove so that it will separate from the fibre readily, it is rotted sufficiently, and should be taken up. The best manner of doing this, is to pick it up with the hands, taking up as much as can be clasped at once, and laying it on the swath; then taking under the swath, and that also, moving it as before, until enough for a bundle is gathered, when it should be set up on end for a few hours before binding. This is much better than raking it, as it is not tangled at all, and each handful separates easily. After it has dried a few hours, it may be bound and placed in the barn, or taken to the mill for dressing. This ends the labor for the farmer, as the dressing is a separate business; but as some may wish to set up machines for dressing, I give a description of the necessary machinery, etc.

Dressing.—First, a water power and wheel are necessary, and then all that is required is the brake and swingling machine. The brakes consist of fluted cast-iron rollers, from six to ten inches in diameter, and about three feet long, placed in a frame, with a heavy spring applied, to press them together on the flax. There are various kinds of brakes, and any one building a mill must be guided by his means and his judgement in making a selection. They vary in price very greatly. The common mills have but two rollers, and the flax is passed through them from four to eight times, or until the fibre and shives can be easily separated. Some of the more expensive kinds will break it sufficiently in one passing through. The apparatus for dressing (scutching) consists of two sets of knives, each set containing five knives, which are fastened to a pulley, each knife projecting about eighteen inches from the pulley. The pulleys are both attached to the same shaft, making about 140 revolutions per minute. At each set of knives is an upright swingling board, about eighteen inches wide, with a notch, nine inches deep, on a level with the shaft. These boards are placed so the revolving knives pass within an inch of the first one, and half an inch of the other, and the tops so fixed that they may fall back away from the knives one-and-a-half inches. The flax is passed from the brakes to the first set of knives, where it is rough-dressed, by holding it in the notch in the board and allowing the

knives to whip the shives out. When the greater part of the shives are out, it is passed to the finisher, who subjects it to the scutching of the other knives, until it is entirely cleared of the shives. Then it is tied up in bundles of 50 to 100 pounds, and is ready for market. One set of brakes will answer for two sets of scutching knives, making employment for five hands. For those not wishing to do a large business, these are the best kind of mills, as they are the least expensive of any in use, the cost of them varying according to locality, price of labor, lumber, etc. The tow that is obtained from the first dressing is called Coarse Tow, and, after the shives are shaken out, is baled and sent to market. That from the other knife, is called Fine Tow, and is disposed of in the same manner. Those wishing to do a large business can find a superior brake in New York, manufactured by a leading agricultural house. They make several kinds, having four to twelve cylinders, and adapted to all kinds of straw, tangled or straight, and varying in price very considerably. One man will dress 50 to 100 pounds per day, in the common machine. One man will pull from one-fifth to one-third of an acre per day, and will whip out the seed grown on an acre in one-and-a-half to two-and-a-half days. One-and-a-half acres is a good day's work for spreading. A good yield is 300 pounds of dressed flax, 100 pounds of coarse Tow, 30 pounds of fine Tow, and 10 bushels of seed. The market price on the 1st of January, 1865, was $3.25 to $3.56 per bushel for seed; 30 cents to 32 cents per pound for flax; 10 cents for fine, and 2 cents for coarse Tow.

THIRD-PRIZE ESSAYS.—No. 20.—BY JOHN E. STEWART,

REDDING RIDGE, FAIRFIELD CO., CONN.

Flax has not been very extensively raised in this section for the past thirty years, but the high price of cotton goods has induced many farmers to turn their attention to the production of the raw material, from which can be manufactured a cheaper fabric for clothing purposes. Consequently, patches of flax begin to show themselves on many of the farms about here, and, setting aside its utility, it is as profitable a crop as can be raised, with us, counting the cost of production and preparation for market.

The usual modes of cultivation, rotting, etc., are those pursued by our ancestors, generations back of generations, and are very defective; in fact, I believe it impossible to produce a good article of flax by those modes.

I have adopted, for the past three years, different practices, chiefly in the particulars of sowing and rotting, and have been amply repaid for my trouble, in having better crops of seed, and a longer, finer, and heavier yield of fibre. I will endeavor to describe the common methods of growing and treating the crop, as well as those which I have adopted instead, as improvements.

Flax is raised for the seed, which grows in little bolls on the top, and for its fibre. It does not exhaust the soil, but should not be sown upon the same land oftener than once in five years, nor should it be sown immediately after upon land where flax has been spread to rot, because flax leaves an ingredient in the soil which unfits it for another crop of flax, but it is not injurious to any of the grains or grasses, or vegetables. If sown upon the same land oftener than once in five years, a good crop need not be expected. One experiment will satisfy any farmer of this fact.

Soil.—Flax requires a mellow, rich condition of the soil, but it will grow upon almost any land if it be not very wet, nor dry. As a general thing, land that will bring good corn will bring good flax, but it will not do to apply barn yard manure to flax ground at sowing time, as it is impossible to mix it thoroughly with the soil, and the flax grows and ripens unevenly. Common wood ashes, sown at the time of sowing the seed, at the rate of twenty bushels to the acre, is an excellent manure for flax on poor soil. I have also used swamp muck with good results. The muck must be got out upon dry ground in the fall, and exposed to a winter's freezing. It is best to draw it on to the land designed for flax, dumping a cartload in a place, thirty loads to the acre. Spread and plow it in in the spring. But the best soil is that which is rich enough without any manure, as is the case in most of the Western States, or that which is made rich by previous manuring. My practice is to sow upon land planted the previous year with corn, provided it was well manured for the corn crop. As soon in the spring as the ground is dry enough to be worked, remove all the cornstalks, weeds, and rubbish from the field to the barn yard, where they will make manure. That the surface may be clean, break up the cornhills, or ridges, by plowing twice through each, and harrow the ground down as level as possible with an iron-toothed harrow. Then plow clean, cutting the furrow deep and narrow (one plowing is sufficient, if well done), and go over the whole with the harrow, until all lumps are broken and pulverized,

and the surface presents a fine, level appearance. It is now ready to sow.

Sowing.—The seed must be new, raised the preceding year, for old seed will not always vegetate. The quantity generally used is too small, varying from half a bushel to five pecks to the acre. The consequence is, the plants grow broad and short, and throw out a great many side branches, which bear seed, but are almost useless for fibre. Thin sowing also gives the weeds a fine chance to grow. I prefer sowing from two to two and a half bushels to the acre, which, being thick, causes it to grow fine and tall, with no branches except two or three to each plant, near the top, while the weeds are effectually choked down. The yield of seed is much greater, and the fibre more than doubled, and of superior quality. The ground being ready, sow as evenly as possible, that it may grow evenly throughout the field, and all ripen at the same time. Harrow in the seed with a tooth-harrow, crossing the last harrowing, and go twice over the whole to be sure that the seed is well covered.

It is best to finish with the roller, and the rolling is indispensable if the flax is to be harvested with the cradle, as otherwise it cannot be cut close to the ground. It may now be left to itself and nature, until it is ripe and fit to pull, which period comes on in this latitude (41°) about the time of the oat harvest—from the 10th to 20th August. [Compare *Covering*, in First Prize Essay.]

Harvesting.—When the little seed bolls upon the top begin to turn yellow, and the leaves upon the stalk begin to drop, and the stalk itself is yellow two-thirds up from the ground, the plant is ripe, and should be harvested as soon as possible, for if it gets over ripe the fibre is harsh and rough. There are two methods of harvesting, pulling and cutting. By the former method, as many plants as can be surrounded by both hands are seized a few inches below the bolls, and with a little jerk are easily lifted from the ground, and laid on the ground, each handful by itself, spread a little, with the root ends towards the laborer. Care must be taken to keep the roots perfectly even, as it saves much trouble and time in the after process. It is thus pulled and laid in straight lines, or swaths, across the field, the root ends all one way. The cutting is performed with the common grain cradle, and the flax laid in swaths, the same as grain. By this method, the fibre on the lower part of the stalk, and the roots, is lost, while the square ends, occasioned by the cutting, are not liked so well by the spinner as when it is stripped the whole length of stalks and roots. Cutting is the most expeditious, and will probably be followed where help is scarce, and the breadth of flax extensive; one man who is able to lay down three acres per day with the cradle can hardly pull a half acre in the same time. Yet pulled flax will bring a much better price, and pay well for the extra labor. But, whether cut or pulled, the after management of the crop is the same.

By the old method, it is left upon the ground until it is cured or dry enough to thresh, which requires sometimes a week or ten days, when, on a clear day, it is raked up, or gathered with the hands, and bound into tight bundles, eight to ten inches in diameter, and carted to the barn, where the seed is threshed out immediately, or it is stowed away, like grain, for a more convenient time. If it is unbound, to be threshed, the straw gets out of its even order, and becomes entangled, which causes a great deal of trouble and loss. It should, therefore, be threshed in the bundle, and the seed cleaned by running through a fanning-mill. The chaff, light seed, etc., which blows out, is valuable for feeding stock, and the plump, heavy seed is saved for sowing, or sold, and brings good prices, finding a ready market. The straw is generally laid aside for awhile, or until the warm weather has mostly passed, and the autumnal rains commence, when it is spread out on the grass to rot. The hot rays of the sun are considered very injurious to flax while it is rotting, for which reason this operation is delayed until cool weather comes on—about the last of September.

I believe the above method of drying and threshing very injurious to the fibre, and have adopted a different plan, but those who wish to dew-rot their flax may as well pursue that as any other mode. It will be perceived that the flax remains on the ground, after pulling, some eight or ten days, exposed to the sun, wind, dews and rain, and in its green state it is burned and dried, so that no subsequent process can separate the fibre from the straw without damaging its quality. By the plan which I have successfully adopted, the flax is not suffered to lie on the ground but two days, or just long enough for the seed to "plump out," as it is not entirely ripe when pulled. Gather it together in handfuls, about as large as can be encompassed with both hands, and bind them together in sheaves a foot in diameter, the little bunches being laid top of each other, roots and heads alternate, so that it may not become entangled. It is carted to the barn and the seed taken off with an iron comb, or ripple. * * * [Description of ripple omitted. See previous Essays.] * * * The large bundles are unbound, and the smaller ones, which will come readily apart, are, one at a time, divested of seed, by drawing the seed end through the comb, which is quickly done at one or two drawing strokes. The small bunches are again bound into large ones, root ends all one way; and the

seed is spread upon the barn floor. Many of the seed bolls will probably come off whole, and require some threshing with a flail before it is run through the fanning-mill. The seed will not be entirely dry, and may be allowed to remain, spread thin for a few days before it is threshed. The straw must be immediately subjected to the rotting process.

Dew Rotting.—There are two ways, "dew rotting" and "water rotting." I have abandoned the former, although it is simple, and much the easiest. Those that dew rot also dry their flax in the field before it is threshed, and wait until cool weather begins before it is spread out to rot. At the right time, it is taken to a smooth piece of pasture ground, or meadow, and spread out thinly, in straight lines, the root ends even, and all one way. After lying about two weeks, it is turned over, a long pole being thrust under it, and a space of several feet turned at a time. It does not need to be exposed quite as long after turning as before, and it is determined by trial when the rotting has gone far enough. Grasp a small handful tightly in both hands, three inches apart; give them an alternate backward and forward motion, a few times, so as to break the stalks, and bring them together two or three times, suddenly jerking them apart. If the wood breaks easily, and flies out, leaving nothing but the fibre, it has been exposed long enough, and must be bound into sheaves, and put in a dry, sheltered place, where, for further operations, it will await the farmer's convenience. Care must be taken that it does not get too rotten, and the fibre weakened, if not spoiled, as is often the case. Flax which has been rotted in this manner, has a dirty brown color, is harsh and coarse to the touch, and often weak and tender. It is worked into rope bagging and coarse articles of cloth. To manufacture it into fine linen is out of the question.

Water Rotting.—When it is designed to water rot, holes must be dug 3½ feet in depth, and in other dimensions according to the quantity to be rotted. A hole 12 feet broad and 18 feet long will hold the produce of a half acre. Prepare the hole near a river, when convenient, in such a situation that it can be kept full of water. Spring water will answer very well, in which case the water must be let into the pool three or four weeks previous to its being wanted for use, that it may get warmed and tempered by the sun. Place the bundles in the hole, somewhat sloping, with the root ends underneath. They should be close together, and in regular courses, the second course lapping upon the first one half its length, the third lapping upon the second, and so on.

A light covering of straw or bog hay should be put on to exclude the light, and rails or stones laid on to keep the flax under water. Fermentation will commence the second or third day, and continue until the flax is sufficiently rotted. Under favorable circumstances, eight days is long enough for it to remain in the water, and sometimes fourteen days is not too long. If the weather be sultry, it should be examined about the sixth, and each day afterward until it has had enough of the water, which may be known by taking a few stalks and breaking them. If the inside, woody part, comes out clean, with none of the bark sticking to it, the flax is ready to come out. Wash the bundles clean of the filth and sediment which may adhere to them, as they are taken out, and set them on the root ends, six or eight together, to drain for twenty-four hours. Its color, now, is a dark green, and it must be thinly spread on smooth grass ground to improve its color and complete the rotting. In six to ten days it will change from green to a beautiful white, the woody part will be brittle and easily separated from the fibre, and, when dry, it must be bound into bundles and stored in the barn.

Dressing.—The operations by which the fibre is separated from the rest of the plant are termed "dressing," and the implements in common use for that purpose are simple and of easy construction. They consist of the brake, sometimes called crackle, the flax-mill, and hatchel. By the brake the woody part is broken into small pieces, which mostly fall out during the operation, while the flax-mill cleans out the remainder and knocks off the outside covering of the fibre. The hatchel is used to straighten the filaments and draw out the knotty fibres, which occur wherever the branches unite with the main stem.

Breaking.—[Description of the brake omitted.] * * * The operator stands near the front end of the brake, with a handful of flax in his left hand, laid upon the lower jaw, while with the other he brings the upper one forcibly down upon it, repeating the blows, moving the flax in and out, turning it over, and changing ends, until the woody stems are all broken. Give it a shake and a flirt, now and then, during the breaking, to expose the unbroken parts.

Scutching.—The next implement is the "flax-mill," which cleans out the "shives"—as the bits of broken wood are called. This is a simple wheel, about two feet in diameter, with four wooden blades, eighteen inches long, projecting from its periphery, and equidistant. Revolution is given the wheel by the foot, hence the wheel should be quite heavy, so as to be continued in motion without much exertion. * * * [Description omitted.] * * * The wheel is set in motion, and a broken handful of flax held firmly with both hands, near one end, is let gradually over the board, and subjected to the beating of the blade. It is turned over and drawn out occa-

sionally, until it is free from shives, when the other end is served in the same manner. This process is called scutching.

HATCHELING.—The hatchel consists of a number of round iron teeth, set in a board, close together, in the form of a circle, six inches in diameter, with the centre thickly filled up with the same. The teeth should be one-eighth of an inch in diameter, six inches in length, and should taper to a sharp point. The flax should be drawn through the hatchel a few times, to straighten the filaments and draw out all knotty portions of the fibre. Each little bunch of flax should be tied around with a few threads of the same, just sufficient to keep it straight, and then bound into larger bundles, eight or ten inches in diameter. These can be pressed into boxes, or bales, ready for market. Care should be taken in all these operations that the flax be kept even at the ends, as when it was pulled, and the fibre straight, for if it becomes uneven and tangled, much loss will occur in the scutching and hatcheling.

REMARKS.—The principal conditions, it will be seen, on which depends a good crop of flax, are rich soil, thick sowing, pulling, rippling, and water rotting. These differ materially from the old methods usually pursued in this section of country and involve more labor, but the value of the flax is more than double, pound for pound, while the yield is nearly double. The writer's experience warrants him in giving, as the produce of an acre, twenty bushels of seed and five hundred pounds of dressed flax. The seed is worth nearly $4 per bushel at present, and the fibre should be worth $1 per pound. The dressing, which is the most tedious part of the work, may be performed any time during the winter, when the farmer has little else to do. Many crops, at this time, are paying better, but cost double for their production, both in hurry and worry.

[NOTE.—The foregoing five Third-Prize Essays are arranged, not in order of merit, but in order of the numbers they chanced to receive at the time of their reception. They are presented, as nearly as possible, in the language of the authors. The following are portions of some of the remaining Essays, selected and condensed, with the view of bringing out important points, in which they either differ from or corroborate the statements in the Prize Essays.—ED.]

ESSAY BY JOHN D. RENGSTORFF,

AFTON, WASHINGTON CO., MINN.—(TRANSLATED FROM THE GERMAN LANGUAGE.)

SOIL.—If a porous, rich, sandy loam, on which flax does best, is not at hand, take any good loam on which a hoed crop, such as potatoes, cabbages, etc., has been raised the previous year. Land, on which corn has been raised the previous season, will produce good flax, if it is free from weeds, and that which was manured the year before is preferable to that which has just been manured. Hog and sheep dung are best for flax; horse manure should not be used, because it will make the flax rust. The soil should be prepared in the fall, as soon as the crops of that season are removed. The land should be plowed at intervals, several times, and made perfectly fine. After the last plowing, leave it unharrowed in the furrow over winter. If the land is binding, and has become too compact by the wet winter, it should be plowed as shallow as possible shortly before sowing time. I prefer a single-horse corn plow, and make narrow furrows. Newly broken up land needs only thorough harrowing to form a good seed bed.

SEED AND SOWING.—In Germany, two kinds of flax are raised—the "short" and "long." The seed of the first was called "sun-flax," because the seed bolls opened in the sunshine, as soon as ripe. It produces a fine and soft flax, but does not yield nearly so much as the long, because the fibre is too short. The seed I have seen in America is the long variety, and is like the seed from Riga, which we got from Bremen. The time of sowing depends on the different climates. The common rule is to sow in spring, when the soil is dry, and no more night frosts are to be feared. But when flax is grown in larger quantities, and other grain crops are raised, flax ought to be sowed a little later, so that the crops will not be ready to harvest at the same time. Flax will ripen 10 or 11 weeks after sowing. Before sowing, harrow the land. Should there be any lumps, they should be broken down fine. 125 pounds of seed are used for an acre. Sow twice, the second time crosswise. Do not fear to sow too much, as the closer the flax stands the finer the fibre will be, and the more weeds will be kept down. Then harrow the land until all the seed is covered, the last time with horses on a trot. If a roller is at hand, the land should be rolled after harrowing. Should there be heavy rains before the seed is sprouted, and a crust cover the seed, so as to prevent the young sprouts coming up, then the crust must be broken by driving a flock of sheep over the flax land. Or it should be rolled with a light roller made of a log

8 to 10 inches in diameter, drawn by two men. After the land is rolled, the young flax will soon make its appearance.

WEEDING.—As soon as the young flax is about two inches high, and weeds appear, they must be exterminated. The weeders sit flat on the ground, and weed on each side of them, as far as they can reach, and hitch along on their hands and seat. The plants are not injured by persons sitting on them; on the contrary, it does them good, because the soil is pressed closer to the roots, which promotes the growth. As weeding is very tedious work, it is best to have the soil so prepared that very few weeds will appear.

HARVESTING.—When the flax becomes of a yellowish color, and the lower leaves drop off, do not delay the pulling lest the good quality of the flax be injured, though the bolls may yet be rather green. When the flax is pulled, it is tied in large bundles, with rye straw or willow twigs, which are set up on the root ends. In this condition the flax is exposed as little as possible to the sun, until it is carted home to have the seed bolls removed. For this purpose, an instrument called the rippler is used, which consists of an iron comb, one foot in breadth, and with teeth a foot long. It can be made by a blacksmith, out of iron plates, which stand so far apart that the seed bolls will be stripped off when the flax is pulled through. The rippler is fastened to a block of wood. In Missouri, I made such a comb myself, out of wood. Taking an oaken plank, with a large saw I sawed out the wood between the teeth, and pointed the latter. This instrument did good service. After the seed bolls are removed, the flax is bound in small bundles, about as large as can be spanned by both hands.

ROTTING. — *Water Rotting.* — Slow running brooks, with sandy, or gravelly bed, or still ponds, the beds of which are free from mud, should be selected for this purpose. To prevent its being carried down stream, should the stream rise, a pole is driven in the ground, at the spot where the rotting is to be done. Then a few bundles of flax are tied crossways, and slipped over the pole. The other bundles are then, one after another, laid around the pole. Brush, or straw, is placed over them, and stones are put on top, so that all the flax will keep under water. If no stones are at hand, sods, with the grass side on the flax, will answer the purpose. The water rotting requires from four to seven days. If the nights be warm, the rotting will be done sooner. After four days, examine it, to ascertain how far the rotting has progressed. Pull a little flax out of one of the bundles, and if the shives break short, when bent, the rotting is completed.

Take the bundles out of the water, rinse them clean, because the gummy substance that covers the flax will color the fibre red, if it is not removed. Sometimes, however, in examining the rotting flax, it will appear to be twisted together and tangled. This is called rough rotting. In this condition, the flax must not be taken out, but you must wait until it is straight again, which will require about two nights. After the flax is removed from the water, haul it to a stubble field, or a mown meadow, and spread it. Take a bundle in the left arm, and spread the flax out thinly with the right hand, while walking backward. Children can hand the bundles to the spreader. Here the flax is left until it becomes somewhat slack in sunshine. When this is noticed, take up a little and break it in the middle, rubbing it thoroughly, and if the "bast" separates readily from the shove, it is time to take it up with a rake, bind in sheaves, and secure it in a dry place. In rotting, remember the rule: "Rather too little than too much rotting." [The writer's remarks on *Dew Rotting* are omitted.]

The seed is removed, after rotting, in the following manner: The flax is laid on a barn floor, or on an even, hard piece of land, and threshed, being beaten with a beetle, or "crig," [as described in the Second Prize Essay, but with a deeply corrugated and cross-cut bottom.] The flax is beaten until it is soft, and is then turned over and the other side treated in the same manner. The more the flax is worked in this way, the less breaking will be required afterwards. In taking up the straw, be very careful to pull out all that hang over, or that do not lie even, and straighten them. After this, the flax is laid up in little ricks, built around a stick, like a broom-stick, set upright in a block 1½ feet square. The flax is laid up in small handfuls, until about five or six feet high, and is there left until wanted for breaking. [The writer's remarks on the breaking, etc., are good, but add nothing to what has been previously given. Of the Hatchel, he says:]

There are two Hatchels in use, the coarse and fine. Those I have seen here are unfit for producing fine lint, and these must be imported from Germany. On the coarse hatchel the flax is prepared for the finer one, and all shives are removed. Through the finer hatchel the flax is pulled, until all the tow is removed.

SEED.—The unripe seed is not fit for sowing, and that which is threshed off in breaking may be used for oil, if an oil-mill is near, and it will make good feed for horses, when scalded with boiling water. The best and most seed may be gained by raising the plants in rows, so that they can be hoed. If sown broadcast, sow thinly, hardly one-half the quantity mentioned before. The seed is ripe when the straw turns brown, and the seeds rattle in the bolls, when shaken. The plants, either pulled or mowed, are left in the sun

to dry thoroughly, and are then carted to the house and threshed at once. The straw has no value. The seed is cleansed in a fanning-mill, and is kept in a dry place, where the changes of the weather have the least influence. Fax seed will last good for six years, if well kept, and that more than a year old starts most uniformly.

Enemies.—The most dangerous enemy of the flax is the weed, spoken of before; then comes the cut-worm. Last summer, I sowed a few rows for raising seed; the plants came up finely, and as there were no weeds in the plot, it happened that I did not visit the spot for several days. I was greatly astonished to find a whole row gone one morning, and, investigating the matter, I found the evil-doer, the cut-worm. With the aid of my wife, I dug out half a gallon of these worms, and fed them to the chickens. A friend claims that, by sowing salt with the seed, and harrowing it under, these worms can be destroyed. Long-continued drouth is also disadvantageous to flax. It often happens that there is but little rain from May to June, and more from July to the fall, it would, therefore, be advisable to sow part of the seed early, and another part late. In parts where prairie land has been broken in the beginning of June, a good crop may yet be raised on such land. In the year 1835, I sowed, in Missouri, in the first week of April, half a bushel of flax seed, pulled the plants eleven weeks afterwards, rippled the flax, dried the bolls and threshed them. The seed thus gained I sowed July 4th of the same year, on the same piece of ground. The plants grew taller, but the fibre was coarser than the early flax, the plants having stood too thinly, because all the seed did not germinate. This double crop produced 66 pounds of clean and very fine flax, for which I received, in St. Louis, 25 cents per pound. * * *

Treatment of the Tow.—The tow, especially the coarser sorts, must be worked over before it can be used for spinning. It is laid in small quantities on the floor, a man sits flat before it, the feet stretched forward, with a willow twig, as thick as a little finger, in each hand, he whips the tow thoroughly, shaking it from time to time to remove all the remaining shives. The tow is twisted up in "heads," spun, and used for weaving bags, workingmen's aprons, tent coverings, etc.; the finer sorts, when flax-yarn is taken for the web, will make good filling for sheets and table-cloths, as also for towels.

ESSAY BY GEORGE W. HICKS,

WARREN CENTER, BRADFORD CO., PA. (EXTRACTS.)

Soil.—I have raised more or less flax, every year, for the last fifteen years, selecting a field that has been planted the previous season with Indian corn, potatoes, or some other hoed crop, to have as few weeds among the flax as possible. I plow it in the fall and spring, with narrow furrow slices, say six or eight inches wide, and ten deep, at each plowing. Then harrow it thoroughly. I have raised good flax on green sward plowed in the fall and harrowed in the spring, but such ground is liable to be so grassy as to injure the crop and to prevent rapid pulling.

Sowing.—I sow about one bushel of seed per acre, when the crop is designed for lint. When seed only is the object, one-half the above quantity is sufficient. If the seed be sowed too thick, the flax will be fine and short. I measure my ground, and sow it in lands six paces wide (going and returning on the same bed). Beginners are apt to sow it too thin (or too thick), unless they measure their ground and seed, and exercise much care when sowing. Some farmers sow two ways, sowing half the desired quantity each way, but this is not necessary if you measure both ground and seed. After sowing, I harrow lightly. Most farmers harrow too much after sowing. I knew of five acres of flax that were sowed, and about one-half of it was harrowed in, when it commenced raining, and rained for twenty-four hours. The other half was never harrowed, and I never could see any difference in it, though I helped pull the whole of it. It yielded eighteen bushels of seed, and about four hundred pounds of dressed flax to the acre. I sowed a lot of six and one-fourth acres, in 1854, and it yielded sixty bushels of seed and twenty-six hundred pounds of dressed flax. In 1863, I raised twelve acres of flax, and it yielded about nine bushels of seed and three hundred pounds of lint per acre. I bought and dressed, in 1863, sixty acres of flax, after it was rotted, and it yielded about three hundred pounds per acre. This season, 1864, I raised five acres, which yielded eight bushels of seed per acre. The heaviest yield of seed that I know of in this town, this season, is thirteen and one-half bushels per acre.

Pulling.—The old rule for pulling is, when one-third of the bolls, or heads, are turned brown. If I have considerable to pull, and help scarce, I commence a little sooner. If it gets dead ripe, it will dress away more. I prefer to pull it a little green, than to allow it get too ripe, as it will make more pounds of dressed flax per acre. I commence on the lower side of the field, if on sidling

ground, and pull a strip about thirty feet wide across the piece, and bind it in small sheaves. When it is dry enough to draw in, I bind each shock in one bundle, as it occupies less room. Some farmers draw it in without binding, but it is apt to snarl and pull out and waste if it is not bound. The best way of threshing off the seed is with rollers, driven by water or horse power. The next best way is to place a large flat stone on the barn floor, with one edge raised sixteen or eighteen inches, and to beat it out upon that.

Rotting.—Flax should not be spread in very hot and dry weather, as the scorching sun injures the fibre, and makes it dark-colored and harsh. It should be spread as soon as the fall rains commence. If left until cold weather, it rots slowly, and will not weigh so much as if rotted earlier in the season. Spread with the tops towards you, as they are apt to snarl when from you. Spread the swaths about six or eight inches apart. When it is about half-rotted, turn it over with a smooth pole, about fifteen feet long. Run one end of it under the swath, near the top of the flax, and raise the top ends and turn it over, letting your pole drop on the flax so as to press it down, that the wind will not blow it away. When it is rotted enough, the fibre will begin to separate from the coarsest stalks, as the coarse flax rots soonest. By rubbing a few stalks in your hands, if the shives separate readily, it is rotted enough. When taking it up, take a common hand-rake, and walk close to the buts and rake it, by sliding it along every time you step. If you roll it as some do, it brings the long and short all mixed together, and does not handful out as well when you brake it. I rake the bundles as large as I can bind handily with a double band. Before binding, you should raise every bundle up fifteen or twenty inches, and let it drop on the buts to even them. When dressing, make your bunches of flax so that they will weigh from fifty to seventy-five pounds. If to be shipped by railroad or boat, it should be sacked, say 150 or 200 pounds in a sack.

ESSAY BY L. M. HOLBROOK,

DUNDEE, KANE CO., ILL. (EXTRACTS.)

The best soil for producing flax with a strong, fine fibre, is a sandy loam that has been well manured three or four years previously, and no other crop raised on it but corn, and this kept entirely free from grass and weeds. It is true that you can raise a tolerable crop of flax on almost any soil, and by almost any process, but remember that you cannot raise a large crop, of good quality, without taking great pains to have the soil in a high state of cultivation. For seed, the very best should be selected, free from every foul seed. As soon in the spring as the weather becomes warm, and the ground settled, begin to prepare your ground for a crop of flax, have it entirely free and clear from all weeds and rubbish of every kind, and work the ground when it is dry enough to crumble and not stick together in lumps. Treading the ground, when plowing, injures it very much. When you have plowed the ground, about six inches deep for common soil, take a fine, heavy harrow and drag it the same way it was plowed. Pulverize it sufficiently so that no lumps will be likely to hinder the growth of the young plants. In the preparation of the land, you lay the foundation for a good or poor crop. After you have sown the seed, it is too late to rectify any mistakes, or atone for any neglect in preparing the soil. As soon as the ground is well prepared, the seed should be sown. Sow, as evenly as possible, from one-half to three-fourths of a bushel per acre. If you sow it mainly for the seed, sow the smaller quantity. But if you want a good quality of straw, sow it thick, as the larger the stalk the coarser will be the fibre, and *vice versa*. After the seed is sown, take a harrow and drag it the same way you did the first time, and be careful and not fill the dead furrows up. Then roll it lightly. If there is any place where water will be likely to stand, it must be drained off, as standing water will kill the young flax in a short time. Flax is a plant that cannot grow with weeds, without being materially injured by them. The general opinion is, that in order to have the best quality of fibre, flax must be pulled before the seed is ripe. In Illinois, until within a year or so past, not much account has been made of anything except the seed. As soon as the seed is fully ripe, it is cut with a reaper, gathered, and threshed, and the straw sold to the factory. As soon as the bolls begin to turn yellow, it is time to pull it. Commence on one side, and take a breadth about four or five feet wide. Grasp a handful near the top and pull it up. When you have as much as you can hold in both hands, lay it down in a swath and continue thus through the field. It is pretty hard work, and will be likely to make your back ache, but it is the only right way to harvest it. It can be cut with the reaper, like grain, but it injures the flax. When you have it pulled, bind it in small bundles, and set it up in stooks, and as soon as it is dry enough so that the

seed will shell out, take it on the barn floor, and lay the heads together, not unbinding the bundles, and thresh the tops with a flail. Do not break the straw more than is absolutely necessary. Then shake the bundles to get out all the seed. There are two methods of rotting flax, called dew, and water rotting. Dew rotting is generally practised in this country. Take your straw to a piece of smooth meadow, and spread it evenly and thin, in swaths. Let it lie two or three weeks, or until the woody part is so weakened that it can be easily broken. Then bind it up, and place it under cover in some dry place. [Account of the operations of dressing, etc., omitted.]

ESSAY BY W. B. MOREY,

GEORGETOWN, MADISON CO., N. Y. (EXTRACTS.)

Soil.—Flax may be grown advantageously on all moderately cohesive soils resting on a sound clay subsoil, if naturally dry or underdrained. The land should be free from weeds. Hence it should best succeed some hoed crop, but very good crops of flax are often raised upon wheat land where barn-yard manure had been freely applied, and the weeds thoroughly exterminated. There is still richness enough remaining in the soil to prove servicable to this crop, without resorting to other means of supplying nutriment. The ground should be thoroughly plowed in the autumn, in time to insure the germination of the weed seeds, that they may be effectually destroyed by the frosts of winter. Fall plowing, if the soil be heavy, is preferable for this, as well as many other crops, and deep plowing is advantageous to insure the success of the crop, and for this purpose the Michigan double-plow is to be recommended. The ground should then be well pulverized, by the use of a harrow, or cultivator. Flax should be sowed as early as the ground is in a condition to be worked in the spring. The ground may be enriched by the application of ashes, plaster, salt, old leached ashes, and phosphates. The three former may be mixed, or used separately, with advantage. Dr. Ure says that 30 pounds of potash, 28 of common salt, 34 of burnt gypsum, 54 of bone dust, and 56 of sulphate of magnesia, will replace the constituents of an average acre of flax. From one bushel to one-and-a-half of clean seed should be used per acre, where lint and seed is the object. Two bushels will give a finer fibre. In those countries where the finest linens are produced, from two to four bushels is the quantity sowed per acre. But in that case, the seed is not allowed to ripen before harvesting. Where flax is sowed for the seed principally, and allowed to get fully ripe, it is then of less value for lint, which is often sold to manufacturers of pasteboard and paper, at fair prices. The yield of a crop of lint will vary from one to two tons to the acre, and the yield of seed from ten to fifteen, and sometimes as high as twenty bushels to the acre.

Pulling, or Cutting.—The crop is ready for pulling when the seed is beginning to change from a green to a pale brown color, and the stalk becomes yellow about two-thirds of its length. Pulling too soon, or allowing the crop to get too ripe, are both injurious to the fibre. In pulling the flax should be separated from weeds, should be pulled when dry, the root ends kept even, and tied up into small sheaves, these may be set up two and two in stooks, from fifteen to twenty bundles in a bunch, and allowed to stand till thoroughly dried. Where but few acres are sowed, it can be pulled by the help of women and children. But if many acres are sowed, great care should be exercised in the preparation of the ground, that it may be clear of weeds and smooth, so that it may be either cut with a reaper or mower, or cradle. The seed can be threshed very fast, with a common flail, when bound in small bundles, by threshing the heads on both sides. Other ways are by trampling with horses, by a threshing machine, by drawing through a hatchel, by rollers operating by horse power, or by whipping over a smooth board, or stone.

Rotting.—This is accomplished either by water or dew. The process of water rotting is said to produce a finer and softer fibre. Soft, or river water, should be used. A tank, or vat, is used for the purpose, where the flax can be covered in water, to remain until properly rotted, the time required, depends in part upon the ripeness of the flax, and varies from ten to twenty days. It should be taken from the water as soon as the lint will freely separate from the woody part.

The more common method is, to spread as evenly as possible in swaths, upon a smooth meadow. It should be turned occasionally, that it may rot alike on both sides. It is readily turned by running a pole under the straw. October is a proper time for this operation. The length of time required for rotting depends upon the condition of the straw and state of the weather. In good weather, with occasional rains, it will rot in from one to two weeks. In very dry weather, it will take much longer. When rotted sufficiently, it is bound in good-sized bundles, as soon as it is dry, and housed, or drawn to the factory to be

dressed. Suitable buildings with machines are now being put up in different localities, where the flax is either bought or dressed, on shares, or at so much per hundred. The old method of dressing it by hand will now be resorted to only by those remote from such machinery.

ESSAY BY CARL BOES,

DETROIT, MICH. (EXTRACTS.) TRANSLATED FROM THE GERMAN LANGUAGE.

Soil.—There are few plants on which the soil has so much influence as on flax. Neither light sandy soils, nor heavy loams, are suitable for it. On the former it grows weakly, for want of moisture, while heavy, binding, clayey soils hinder its growth. I do not say that heavy soils should be avoided, on the contrary, a strong soil is suitable to flax, but it must be worked fine, and not bind and bake after rains. A mellow soil, mixed with old vegetable mould, is best. After a piece of land is selected for flax, it is manured in the fall, and the manure plowed under. In the spring it is again plowed and harrowed. Land having been manured and used for hoed crops, such as cabbages, potatoes, etc., may be plowed and harrowed in spring for flax, without previous manuring. Land that has been down to grass, or clover, and broken up the summer previous, is especially desirable. Although moisture is beneficial to flax, wet soil is not suitable, and low lands must be well drained.

Sowing.—The seed should not be sowed until danger of frost is past, the cold rains have ceased, and warm weather has come. Therefore, the preparation of the soil for seeding cannot be commenced early. The particular time of sowing cannot be given in this extended country. The time of sowing ranges from the middle of May to the beginning of June. Here in Michigan, and further North, it is not safe to sow before the latter date, as a late frost may kill the young plants. In the Middle States, and at the East, the sowing may be done earlier, according to circumstances. When the time for sowing has come, the soil is thoroughly worked with the cultivator, which I prefer to plowing, and is then harrowed finely. This double working in the spring is beneficial for two reasons. First, on account of the early plowing, and the working afterwards, the soil becomes more porous and fertile, and retains the moisture longer. Second, the weeds that have grown in the meantime will be destroyed. When the soil is thus prepared, the seed should be sowed. The seed should be fully ripe and glossy, not musty, as it is sometimes, on account of carelessness in drying, and it should be entirely free from weed seed. If the seed is not clean it should be made so by sifting. The proper quantity of seed is 2½ bushels for an acre. The seed is sown in the same manner as other small seed, and is harrowed in thoroughly.

Weeding.—When the flax is four to five inches high, the work of weeding commences. This is a necessary labor, not only for the better growth of the flax, but the weeds will hinder the work materially at the time of harvesting, when they will have grown tall. The cultivator must be particularly careful to exterminate a weed called "Flax-Dodder" (*Cuscuta epilinum*), which is plentiful in flax-growing countries. It is a parasitic vine which grows upon and winds itself around the plants. This hinders not only the growth of the plant, but is also very troublesome in dressing the flax. [This plant is smaller than, but very much like, the common American Dodder (*Cuscuta Gronovii*), which is a leafless, light orange-colored vine, clinging to other plants, and living upon their juices, and having numerous tufts of small flowers.—ED.] All of a household take part in weeding, and I gladly remember the time, in my youth, when flax was to be weeded; to expedite the work, the youngsters were offered a little reward. The weeding is done by each one taking a strip as wide as he can reach the weeds on each side. Bending the plants does not injure them. The next morning after weeding the difference may be distinctly noticed in the field. The riddance of the weeds and the loosening of the soil in consequence, gives the plants a strong and healthy appearance.

Harvesting.—When flax has made about two-thirds of its growth, the flowers come out, giving the field a very attractive appearance. After flowering, the seed bolls appear. When the flax haulms become of a yellowish color, the leaves die, and the bolls become brown, the harvesting should commence. It is not necessary to wait the full maturity of all the bolls, as this would injure the quality of the flax. The crop is pulled by grasping a handful of haulms with the right hand, and then helping with the left hand. The haulms remain in the left hand until it is filled. The flax is spread evenly, in rows, just behind the workman. This is continued until all the flax is pulled. Here the flax is left for eight days, and is then turned over with a long, smooth stick, bent a little at one end, and is left to remain for eight days more, after which time it is bound and carted home. The next work is to free the flax from the bolls, by drawing the top ends through a rippler.

The governments in flax-growing countries of

Germany encourage the use of foreign seed, by giving the seed to the poorer classes of the districts at reduced prices or on long credit. It would be advisable that some of our seed-dealers procure some of the new Riga seed, which can easily be done through a Bremen or Hamburg house, so that those who wish may try it. The flax is now ready for the brake, and only needs drying for this purpose. A sunny day is selected and as much flax as is intended to be broken that day, is placed alongside of the building or in other similar exposure, and the flax is taken for breaking directly out of the sun. There are other methods of drying flax, such as putting it into a still hot baker's oven, or digging a trench in the ground, over which a light scaffold or platform is made, on which the flax is placed, a fire being kindled below. Those methods are not only dangerous, because the flax may easily take fire, but they require, especially the latter, the steady supervision of a careful man. (Description of dressing, etc., omitted.)

The process of hatcheling must be preceded by scutching, as the flax fibres still stick together, and must be parted, so that the hatchel will not tear them. For this purpose a scutching-board is used. An upright board, with a foot piece and a swingle blade. Some of the straw is taken in the left hand and placed through the opening of the board, while with the swingle in the right hand it is hit downward. The flax is held as much as possible apart, and the points of the swingle help doing this. After the handful is turned over several times, shaken and swung sufficiently, it is twisted around and laid aside, and the work continued in the same way.

Now the last work, to hatchel the flax, is to be done. The machine for this purpose consists of a ½-inch board, 1 foot broad and 2 feet and a few inches long. On this the hatchel is fastened, which is a block 7 to 8 inches square and 4 inches high, a little smaller at the top than at the bottom. A piece of tin is fastened on the top, into this holes are made, and the steel needles, a little stronger than knitting needles, 5 inches long and evenly pointed at the top, are inserted. The distance apart is $^{3}|_{16}$ to $^{3}|_{8}$ of an inch, according to the fineness the flax is desired. In hatcheling, this machine is taken between the knees, and the feet rest in the openings at the lower end, or a kind of stool may be made, with two open arms, into which the hatchel is placed and fastened by bolts. Some lay down a chair, fasten the hatchel upon it, and draw the back of the chair towards themselves. Half of one of the scutched beets taken into the right hand and brought over the hatchel, with the left hand the lower end is taken hold of and pulled, while the right hand makes an up and down motion. Proceed thus until the desired fineness is reached. For very fine flax two hatchels are necessary.

ESSAY BY "NOVICE,"

SARATOGA SPRINGS, SARATOGA CO., N. Y. (EXTRACTS.)

GROWING.—*Soil.*—Any good, strong, well cultivated ground, that is free from grass, sods, and weeds, and will raise a good fair growth of oat straw, will answer for flax.

Preparation of the Ground.—If the soil is heavy, the lot intended for flax may be plowed in the fall. If a light soil, it should be plowed as soon as the frost is out of the ground in the spring. Harrow the ground well three or four times, at least, to provide a good seed bed, and to enable the young flax plant to root readily in the soil.

Seed.—The best kind of seed to sow is the Riga. It yields more seed per acre, and more flax per tun of rotted straw than other kinds that I am acquainted with.

Time of sowing.—The same as with oats. As early as the season will permit, as the flax plant makes its best growth when the weather is cool and the ground moist.

Where flax is raised for the seed alone, one half bushel is sufficient seed for an acre. For fibre and seed together, one and one half bushels will answer. For fibre alone two bushels is better, as the plants will be crowded, grow slender, and without branches, which is desirable, as the flax straw will handle better, make better dressed flax, and yield more per tun of straw, and also more flax per acre.

Sowing.—The seed should be spread evenly over the ground, and then be well harrowed into the soil. Some go through their flax on their knees as soon as weeds appear and pull them out. Others wisely defer weeding until pulling time.

Time to pull flax—Is when two-thirds of the bolls are ripe. If there should be wet places where the flax is green, and places where the flax has fallen down, they should be pulled before the main crop, and each kind kept by itself.

(Pulling and binding omitted.)

The flax should be set up on its root ends as soon as possible, placing from four to six bundles together in a stook, so as to dry evenly and quickly. As soon as it is dry, it should be drawn to the barn and stored away, to prevent its being

sunburned, as burned flax will not rot evenly. To remove the seed, place a large stone on the barn floor or other tight floor. Incline the upper surface of the stone to about the angle of forty-five degrees, block it firmly in its position, and you are ready for work. Now take a bundle of flax in both hands, clasping it near the root ends, raise the bundle above your head and strike; bring it down across the stone, the bolls will fly in all directions. Repeat this a few times and the bolls will be all whipped off. Jam the root ends against your breast to even them and the operation is ended. Some roll them off by machinery, but boys, with the assistance and direction of one man, will whip them off cleaner, and the work will be nearly as cheaply done without the extra cost of machinery. The bolls may be threshed with a flail, trod out by horses, or passed through a machine set for threshing grass seed or clover. Flax seed may be cleaned in a common fanning-mill, by providing suitable sieves, and when cleaned it is ready for market. Here the labor of the farmer should cease, and those of the manufacturer begin. The farmer raises the straw, but cannot always spare the necessary time and labor at the proper season of the year properly to prepare his flax.

Water Rotting.—This should be done if possible while the weather is warm, because the agents to be used are warmth and moisture.

Pool.—A pool may be dug in any place where soft water may be found or collected; or if this is not attainable, any pond or river of soft water may be used, providing the water will make good suds with common bar soap. Such is not too strongly impregnated with minerals. Set the bundles of flax tops down and roots uppermost in a row, at one side of the pond or pit, inclining the straw at an angle of forty-five degrees. Add to the first another row, shingle fashion, and still another, until you have enough down to manage at once, say 1,000 lbs. of straw in a bed. Now lay on the roots poles or slabs, and on them stones enough to settle the bed under the water. It will stay there until you want it to come out. If the *weather is warm* and the *water also*, look to your bed the *second day*, and if the woody part separates easily, and does not stick to the fibre, it is ready to *come out*, and the sooner you tend to it the better. If it does not separate readily, let it lay a few hours, but examine it very often, as a few hours time may destroy a valuable bed. When it is ready, take the flax from the water and let it drip some of the water out.

Spreading.—This should be done carefully. Break the bands and spread it as soon as possible in thin, even swaths, on a meadow to dry. The roots should be placed evenly together.

Taking up.—As soon as it is dry, take a hand-rake and draw gently together, without rolling the straw, into a small bundle, bind and set it up to dry out any remaining moisture it may contain. House the flax, and you may repeat the operation if you please on a new bed if any is left. You will notice as you look over your rotted flax that there is here and there a handful of straw so rotten that it will not bear handling. This was either green or lodged, and should have been kept by itself and rotted by itself, as you may do now if you have saved any separate. No amount of care or skill can make good flax from poor straw. More depends on the treatment flax receives in the field, after pulling, than most farmers are willing to allow. Water-rotted flax is rotted evener, is brighter and stronger, and will bring a higher price in the market than dew-rotted flax. But if soft water is not attainable or help is scarce, the flax must be dew-rotted.

Dew Rotting.—To accomplish this the flax is spread evenly upon the ground, like water-rotted flax, and is allowed to remain nearly two weeks, when it is turned. This is done readily by running a small pole under the flax and turning it completely over. It is allowed to remain in this position until the woody portion will separate readily from the fibre.

Taking up.—Take a hand-rake and draw it gently together, without rolling the straw, into a small bundle, bind and set it up to air, and remove any remaining moisture, as it should be perfectly dry before housing. It will not bear exposure equal to water-rotted flax. House the flax where moisture will not readily penetrate, and if sold in the straw it is ready for market.

Sometimes it is advisable to get the flax dressed, so as to obtain a fair compensation for our labor and capital invested, and compete with speculators in market. In this locality we can have our flax dressed for 3 cts. per lb. of dressed flax, and bailed in good condition to send to distant markets. Well-rotted, good flax, will yield 500 lbs. dressed flax per tun of straw; poor flax in proportion. In localities where speculators control the market, farmers do themselves a great injustice if they do not combine and purchase the necessary machinery to work up their own flax in good condition, and thus supply the increasing demand for a staple product of our country. It will pay to transport dressed flax as far as flour or pork can be freighted at paying prices. Farmers living in the West, and others distant from large markets living near transportation, may, by watching the market reports, successfully compete with those living nearer the place of consumption, or manufacturers. Profit and loss vary from $30 per acre *clear loss*, to $80 per acre *clean profit*, is quite an important step for a farmer to make on a single acre of

ground. He is an unfortunate man to lose more than thirty dollars, and a very fortunate man to gain eighty dollars clean profit per acre.

From this estimate it will be seen that there is considerable expense incurred in cultivating and preparing flax for market, and at the same time quite a wide margin for profits for the man who intends to raise flax for market as a speculation, to consider. The capacity of land to produce is so variable, and drouths and other adverse circumstances so prevalent, that it is impossible to fix permanently the limits of profit and loss of any of the staple product of this or any other country. I know an old farmer, who, last season, made fifty dollars per acre on flax, was so elated with his success that he hired all the good land he could bargain for at a fair price, in his vicinity, and, owing to the drouth, lost twenty dollars per acre on all he had under the crop. He came to the conclusion that flax will not pay, and yet his corn crop was a total failure. Still he did not conclude to reject it as an unprofitable crop. Another farmer had a good crop of flax, and after it was ready for market, overreached himself in the sale, and found to his chagrin that the crop was produced at a loss. He will not raise flax again. Another, whose land is poor and sandy, seeing a statement that "fifty dollars could easily be made from an acre of ground," sowed five acres as an experiment. He received four bushels of seed and a proportionable amount of straw, four inches long, and now (justly enough he thinks) estimates the "flax speculation" as a "humbug." I think the average profits, acre by acre, in average seasons, to be thirty dollars per acre. I do not mean to be understood as saying that under favorable circumstances that this is a proper estimate. I think that on good soil, with good cultivation, a good to fair season, care in harvesting and rotting, with good dressing, a judicious marketing, and a fair price, that my limit of profit may be reached, (i. e., that $80 may be made clear of all expense on a single acre of ground.) As a novice in flax culture on medium to good ground, may wish to embark in the enterprise of raising flax, I will say for his encouragement that I made $25 per acre on medium soil, under unfavorable circumstances, with extraordinary prices paid for labor, operating against me the expenses, consuming one-half the returns from the sale of the crop. I do not think the flax crop exhausts the soil any more than oats or wheat, while the returns from the sale of the flax and seed will nearly double that of either oats or wheat, and the profits are sufficient in most cases to return as much as the land used for the crop would probably sell for, the first season it is occupied.

ESSAY BY S. C. GORDON,

SOUTH EASTON, WASHINGTON CO., N. Y. (EXTRACTS.)

Flax has been raised on my farm every year since 1810, as a member of a regular rotation of crops. In the year 1810 I was left with a farm, and legacies to pay to other heirs. Among other experiments tried was that of cultivating flax, and this, which we soon found, would yield in a favorable season more money than any other crop we had tried. Our friends remonstrated against raising a crop that was so deleterious to the land, assuring us, that if we persisted in sowing flax that our farm would be ruined, and finally set us down as insane for our perseverance in raising more each succeeding year, but the soil continued to improve. In 1820, we had 40 acres of flax growing, and the most of our adjacent neighbors had each a few acres. The soil throughout this region of country is rather a cold, springy, yellowish, slaty soil, on a blue hard pan, abounding in small stones. A strong rich soil naturally, yet heavy and hard to till.

In selecting seed, we much prefer the "sapling" variety, as the straw is stronger, not so apt to fall, and the yield both of lint and seed is greater. Our practice has been to sow flax after a crop of Indian corn. We apply upon a pasture sod that has lain two or three years, a good coat of barnyard manure, in the fall, and plow it if convenient. If not, plow it early in the spring and plant corn. In cultivating the corn crop, great pains is taken to kill the weeds, particularly the Canada thistle, which abound here. In the spring following, the corn hills are split with the plow as early as the soil will permit. In a few days it is cross-plowed with great care to have it well done. Then it is well harrowed that the earth may be fine and free from clods, as the seed is much more likely to take well if the ground is in prime order. The seed is immediately sowed broad-cast, about one bushel to the acre, and harrowed in, going twice over the field with a large square harrow, of two leaves hung together with hinges. The earlier the seed is sown in the spring the better for the flax. A slight frost will not injure it after it is up, but rather cause it to branch out and cover the ground more closely, consequently it will produce more seed than a straight stalk, and will not be so apt to fall from rain or wind. If the soil has been made too rich,

and the flax grows too rampant, it is apt to be blown over, or fall by its own weight, before it is ripe, and nearly destroy both the lint and the seed.

The Seed for sowing ought to be entirely clean, and free from foul seed. We sift ours through three sieves, one coarse splint one, to take out any substances that may be left, from the fanning mill. Then we use a coarse wire sieve with long meshes that lets the flax seed through, and retains coarser seeds; then, a finer wire sieve, with square meshes, that will retain the flax seed, and allow any finer seed to go through. This leaves the seed in fine order and pays well for extra work.

Weeding the flax should commence when it is about six inches high (if there be thistle among it), while their roots are tender and the ground soft. We use wooden pinchers similar to a blacksmith's forge tongs, having handles about 3 or 4 feet long for pulling weeds. It gives a long reach. Sometimes it may be necessary to go over the field a second time about two weeks later to secure good pulling, if the flax is not too large by this time. It is not well to go much among it after it is in bloom, as it is tender and easily broken down.

Harvesting.—Pulling is commenced as soon as it assumes a fine golden hue, before the seed is ripe, and being a slow operation, it should be done before the flax gets too ripe and brown. We employ men, women, and such children as are old enough, to assist in this work, paying them usually by the acre. It is pulled with care to keep it even at the but or root ends, and bound into small bundles as it is pulled. These are set up in small shocks, of six or eight bundles each, where it is left to cure. When so dry that the seed will easily shell out, it is drawn to the threshing floor, we put a band round each shock as it stands in the field, this keeps the flax from slipping and becoming uneven, and it will not shell off so much seed in handling it, afterward. Whipping off the seed, we have done by taking one of the bundles and striking it hard on a block of wood, or a barrel laid on the side; either answers very well, the block or log perhaps lies more solid. Many are using a roller machine for taking off the seed, which does it more quickly, but leaves the flax uneven by drawing it between the rollers. After the seed is whipped clean off of the stalks, the little bundles (or *beets*) are thrown in a heap until there are enough to bind, say six, eight or ten, they are then bound and thrown in a heap at the barn door, where it may lie for a week, or until the crop is all cleaned off, if there is no rain to wet it. If it gets wet it should be drawn to to the field immediately and spread, particularly if the weather is warm.

Rotting.—For rotting the flax we usually take it to the meadow or pasture where surface is smooth, and drop the bundles over the ground to be convenient for the spreaders. The spreader follows, takes up the bundles (beets) and spreads them, laying the flax about half an inch thick. After getting across the field, he turns and spreads back, leaving a space of three or four inches between the swaths, and the tops all the same way.

If the crop is large it is better to spread or put it out to rot at different times, that none be overrotted by lying too long. If the weather be cold and dry, it requires much longer time than in warm, damp, or rainy weather of early fall. I think it better to turn the flax over when it is about half or two-thirds rotted, it gets more evenly done, and is not so apt to be streaked.

I prefer the flax that is rotted late in the fall, the progress of rotting being slower and the rays of the sun less powerful, it passes through a kind of bleaching process which softens the lint, and gives it a soft silky appearance, one more surer of an even rotting, and more time in securing it. [The completion of the rotting process is determined as elsewhere repeatedly described.]

Dressing flax in the mills is the almost universal mode of preparing the crop for market of late years, and this is a great saving both of time and lint. The flax is taken to the mill at such times in the winter as it can be received, or as soon as there is a vacancy in the mills, there it is dressed and tied up in parcels of perhaps an hundred pounds each, in order for market.

In storing away flax after it is dressed we prefer a rather damp place, and think the flax is improved by laying some weeks in a moderately damp room, not in a cellar, but rather in a half-under-ground room. Flax keeps finely in such a room, and will improve in softness of texture and increase in weight.

Some farmers sell it on the ground before pulling, others pull it and store it and then sell it, others again, go farther and whip off the seed and then sell it, with the understanding that they will rot it and put in the barn, and the purchaser takes it from the barn.

We have thought it the better way to have the crop dressed and stored before offering it in market, unless the dresser himself became the purchaser, and received it at the mill, saving to the farmer the trouble and expense of drawing it home, storing and marketing it. For several years past speculators have been plenty, to purchase all that has been raised, and are willing tc pay remunerating prices.

ESSAY BY N. WRIGHT,

HORNELLSVILLE, STEUBEN CO., N. Y. (EXTRACTS.)

The most suitable ground for flax is a good mellow loam (not sandy) or wet, which has produced a hoed crop the previous year. Such ground is not as liable to be weedy. It ought to be in a good state of cultivation, so as not to need manuring, as manure is apt to make it lodge. I have known it to lodge in spots where manure was applied, so that there would be neither fibre or seed. Plow the ground well twice, and harrow before sowing. For a brush harrow take two hardwood trees, about three inches through at the but, and twelve feet long, with all the limbs on, and two more trees about two thirds as large, and wind a chain around the but ends, to hitch the team to. Spread the trees with the largest ones on the outsides, in the form of a crotch harrow; and fasten a stick across them about the middle, to keep them spread. Draw the brush crosswise of the furrows and it will brush about twelve feet at each time crossing. If some of the largest limbs make too large a mark, cut them part way off. I have never known any one to raise flax on sod ground. It used to be said that flax would not do well on the same piece of ground two years in succession. I once saw this tried, and the second crop was not more than two thirds as large as the first. As soon as the ground is in good order to work in the spring, sow the seed and harrow it in well. Procure good plump seed and be sure to have it clean of grain and all foul seed. I used a sieve made about the size of two sheets of tin, with a wooden rim about 3½ inches wide around it. The holes in the sieve were about ⅛ of an inch long, and wide enough to let the flax-seed through, but not the grain. For separating weed seeds I used another sieve made like the first, only the holes were small and round, and would not let the flax-seed through. One bushel of seed to an acre was considered enough. When the leaves are dead half way up the stalks, it is time to pull it. Some men prefer to pull what they can hold convenient in their hands; and bind it as fast as it is pulled, and set it up in bunches to dry. Others spread it on the ground as fast as it is pulled. Let it remain spread until dry; then take it up and bind it in bundles about as large round as a water-pail, as larger ones are more apt to "snarl" together by the heads. It ought to be taken up with the hands and not with a rake. If it is raked up, it is difficult to separate it, to whip off the seed. After it is taken up it must be sheltered to keep it dry until put out to rot. My manner of threshing off the seed is, to place a barrel on the barn floor, on its side, to thresh on. Unbind a bundle, part off as much as you can well hold in your hands, and whip the heads on the barrel until the seed is off. If your flax is tied in handfuls when pulled, as some do, you will have no unbinding and binding up, when you whip off the seed. It is quite necessary to have a dry day to whip the seed off; and if it is sunned that day, it will whip all the easier. It is sometimes necessary to thresh the bolls to pieces with a flail before cleaning the seed, as many of them remain whole.

When it is to be rotted, spread out in thin swaths on a low piece of ground, where it will not be overflowed with water. When it is rotted enough the fibre will start from the stalk at the branches, as it appears to shrink in length, so as to pull straight across the crooks that are formed by the branches. Another way of ascertaining when it is rotted enough is to take a few spears in the hands and rub them, and see if the woody part will break and come out easily. When rotted enough, it must be taken up, bound in bundles, and put under cover until dressed out. The latter part of September is the best time to put it out to rot. It is better not be spread until most of the hot dry weather is over for that season, as it will rot soon enough to be taken up before winter.

To break flax, unbind a bundle and part off nearly as much as you can grasp with both hands, always taking some care to keep the but ends even, and put the top end in the brake, and break it one third the length, so that it will be easy to hold. Then grasp it with your left hand, and lay the but end of the handful on the brake; and with your right hand spread it in the shape of a fan. Then hoist the head of the brake, swing the flax in edgeways, as it breaks much easier for being thin than it does to be in a bunch. Turn it over in your hand as you break it, until it is well broken. Then whip it over the brake to get some of the shives out. Pull off some of the longest ends and put them on the handful, so as to keep it even; put the top end of the handful in the brake again, and break it until broke enough. Then whip it over the brake again to clear out the shives, and pull off some of the long ends again, and put on the handful to even it, and it is finished. Twist the handful and lay it away until you are ready to swingle it. The object of twisting it is to keep it from snarling in case it is handled before it is swingled.

Before swingling, it is necessary to have a

natchel, or, as some call it, a flax-comb, which is made by putting a lot of some forty teeth or more, made of iron or steel, five inches long, three-sixteenths of an inch square at one end, and tapered at the other, to a point. Set a row of them a little less than half an inch apart, in a board one and one fourth of an inch thick, then set another row about the same distance that the other teeth are apart, and so as to break joints with the first row, then another to break joints with the last row set, and so on until you have a hatchel with about eight rows one way, and six rows the other way. A smaller one will do, but a larger one is better. Flax swingles easier if partially hatcheled.

The manner of swingling flax is to lay the top end of a handful over the end of the swingling board, and whip it with the knife, and turn it over and whip it again until most of the shives are removed. Then change ends with it. After swingling out the shives on the outside of the handful, hold it up before you and let the end bend down over your hand, and with your right hand part and turn it inside out, so as to get all the shives out. It is best to pull off some of the tag ends occasionally, and lay them on the handful, so as to keep it even. When swingled clean, twist it and double it, like a kink in a rope, and lay it away, and after you get a lot dressed; it may be tied up with a wisp of flax or other string. When swingling, I used to hit the flax occasionally with the knife, when raising it up, so as to throw a portion of it up over my hand that held it. Then strike so as to draw down a little more at each stroke, until I had drawn it all on to the front of the board. When it is very dry, it will dress clean without turning the handfuls inside out, as described.

ESSAY BY ROBERT GRAY,

DENNISON MILLS P. O., SHIPTON, E. T., C. W. (EXTRACTS.)

There is a great difference of opinion in regard to the kind of land suited to the culture of flax. You can grow it on any kind of land if it is dry. When I was engaged in the cultivation of it in the Old Country, I mostly sowed it after potatoes, in which case I always found it to do well. The manuring for the potatoes left the land in good order, and the weeding and picking off the stones left the land clean, a thing you must always do in order to raise good flax. Sometimes when the land was too rich, I took a crop off it of oats, before the flax. Land that has been pastured for a few years is well adapted for it. Land that will grow good corn will give good flax. On the lighter kind of soil the Riga seed will do best, as it is naturally of a stronger growth than the Dutch or American seeds. There are four kinds of seeds in use in Ireland—Riga, Dutch, English and American. Being grown on a light soil makes the stalks grow finer, therefore the woody part of the stalk is reduced, and also the fibre is increased and of a finer quality. If sowed on heavy clay or rich bottom lands, it must be sowed very thick, else it will grow too rank, and the fibre coarse. On such land I always sowed the Dutch or American seed. Where flax is raised only for the seed, the Riga is the best. Where you raise it for the fibre alone, the Dutch seed is the best. But I believe the Riga will do best for this country, as it is the best for seed, and the second in quality of fibre. In Ireland, where flax is raised for fibre only, they will get from 200 to 240 lbs. of dressed flax from a bushel, sowing in a good season on good land. And I have known as much as 320 lbs. to be got on very rich land. In Ireland and Scotland they put from 2 bushels to 2½ seed to the acre.

Land for flax must be plowed in the fall. Then plowed again in the spring, not too deep, or else you will turn under that part of the soil that was exposed during the winter. The finer the soil is pulverized the better: harrow well before and after sowing; sow from fifteenth to the twentieth of May; pick off the stones and clods. Many farmers in the Old Country pass a light roller over it on light soil, when it is sprouted about an inch above the ground. I have never done so myself, but I have seen it done often, and with good effect, too. Be careful and pull out any grass or weeds that may spring up amongst it; no other care is necessary until it is ready for pulling. When the bolls containing the seed are turned of a brown color it is time to pull it; but if you care more about the seed than the fibre, you must let it become riper. A dry day is the best to pull flax. When you go to pull, catch it near the top, as much as you can conveniently hold in your hand, pull it out of the ground, strike the roots against your foot or something to knock off any dirt that may adhere to it. Tie it up in sheaves and shock it as you would grain. If you want to take the seed off, do it with a rippling comb. If you want to make good flax, you must steep it within two days after pulling. For steeping select a place where you can conveniently have about four feet depth of

water, and if possible a place where you can have a grassy sward for sides and bottom of dam. This is to be preferred, for mud or clay diffused in the water is apt to color the fibre. So particular are they in Ireland on this point, that when they cannot have such a pond, they strip the sods off a field to line it with, cutting them only about an inch thick so that they may have as little clay as possible. Having filled the hole with water a few days before it is wanted for use, in order to subject it to the softening influence of the sun and air, then proceed to put in your flax in a sloping position, roots down. Then place some stones or sods on top so as to keep it down, for if allowed to get above water it will spoil. Let no more water run in, only to make up the waste from evaporation. It will take from a fortnight to three weeks to steep, according to the softness and temperature of the water. Very cold or hard water will take longer, but the only certain test is to take a few stalks and break them, and if the outer part, which is the fibre, separates from the inner or woody part, it is time to take it up. Then allow it to stand a day on the bank to drain before spreading it on the field. The best place is a dry meadow; it will keep the article clean, and benefit the grass more than any other thing you can put on it, as also the water which you have steeped it in is a most valuable manure, especially for grass land. Spread the flax on the field in thin, regular rows, and if a shower of rain would fall on it so much the better, for it would wash off a certain gummy substance which adheres to it. To know when to take it up, take some of the stalks, break them at the top, and if the fibre will strip off easily from top to bottom, it is ready to lift, if dry. Tie it up again in sheaves; then you can house it. But if not perfectly dry you must give it plenty of barn room, or stook it out a while, if the weather is fine. It is then ready for dressing. This ends the cultivation of flax. I thought on giving you an account of the manner of hand-dressing or scutching, but it is a tedious way compared to the present improved manner in which it is done by machinery. The capital required is but small, and there are men enough who have capital to engage in the business if they were only stirred up, and it is very profitable (and likely so to continue for a considerable time to come).

ESSAY BY G. E. W. LEONARD,

CEDAR RAPIDS, LINN CO., IOWA. (EXTRACTS.)

FLAX RAISED CHIEFLY FOR SEED.—Any ground on which you can raise corn, will raise flax; yet, from my experience, I would prefer sandy loam. *The preparation is of great importance.* Plow your ground thoroughly and deeply in the spring, which, as a general rule, is better than fall plowing, leaving the ground more mellow; less inclined to weeds, that sometimes may drift with snow from the neighbor's farms. Then harrow it twice thoroughly. Be sure you have good and clean seed. Half a bushel to the acre on common soil is sufficient. If the ground is rich, sow it thicker. After it is sown evenly, harrow twice, and roll it. The best time of harvesting is when about three-fourths of the bolls have turned brown. If you wait later the seed will waste. If harvested sooner, it will shrink, and sometimes mould, if the weather be rainy.

From boyhood to manhood, the universal custom in my native State was pulling by hand, binding in small sheaves, and threshing by hand. But here in the West I have found a much easier and faster way. I use one of the best Reapers and Mowers, combined, with two horses, and one hand. I harvest ten acres a day, cutting it close to the ground, leaving it in little bunches, where I let it remain five or six days; then I draw it to the barn and put a load on the floor, and tread out the seed with three or four horses abreast, turning it once over in the meantime. I then haul the straw to the meadow and spread it out to rot, and when it is rotted, take it to the factory. The seed is run through a fanning-mill and taken to market. It can be cut quite fast by a hand cradle, going back and forth, and laying two swaths together. Let it lie till dry; rake it up in the morning when damp, then draw to the barn to tread out. Those that have no barns, can make a floor on the ground. Those that raise but little, harvest it by pulling. The seed is whipped out on a stone or block of wood.

For rotting, I spread it out evenly on a meadow. Sometimes it will need turning, if it does not rot evenly. It usually takes about three weeks to rot it sufficiently for the brake, or for sale at the factory. The length of time depends on the weather. You can readily tell by taking five or six stalks between the fore finger and thumb in each hand, and rubbing them up and down. If the stalks break to pieces readily, and drop from the fibre, it is ready for the brake, and should be housed at once, for if left too long the fibre rots.

The old way of dressing was by the hand-brake, which is slow and tedious, but will answer for family use. Where there is no factory, I would recommend using superior machines.

GLOSSARY, OR EXPLANATION OF TERMS.

Aspect.—The point of the compass towards which land slopes.

Bast.—The long fibres.

Beets.—A small sheaf of flax.

Blay.—Silky lustre.

Boll.—The seed capsule of the flax plant, cotton, etc.

Brake.—The implement for breaking flax, which see.

Breaking.—Any operation resulting in reducing the woody part of the plant to small pieces.

Brushing.—Drawing bushes or small tree-tops over newly plowed land, usually to cover seeds.

Crig.—A kind of beetle-like flail.

Dam.—A pool for rotting flax.

Dead Furrow.—The furrow left through the centre of a land, from which furrows were turned each way.

Exhaustion of Land.—Failure of the soil to produce good crops on account of repeated cropping without proper manuring.

Firing Flax.—Drying by artificial heat.

Flax.—1. The plant. 2. The dressed fibre.

Gavel.—Properly an unbound sheaf.

Grassing.—Spreading upon the grass for drying and for rotting.

Green Manure.—A crop plowed under where it grew, (as clover.)

Grub.—To work over the land by hand with hoes, or mattocks, instead of plowing.

Hand.—A handful of dressed flax.

Handful.—As much flax as may be held in the hand; applied to undressed flax.

Hard-pan.—Indurated sub-soil, or upper part of it.

Hatcheling. (Hetcheling).—Freeing the "long line" from tow with a hatchel, and reducing the fibre to a greater degree of fineness for spinning.

Haulm.—Stems or stalks, as of grain, clover, peas, flax, etc.

Headers.—Sheaves which cap a long stook.

Land.—The piece of ground struck out by the plowman, and plowed, turning the furrow, slices outward.

Lea.—Land in grass.

Line, Long Line.—The dressed fibre of flax, the raw material of linen.

Linseed.—The seed of flax.

Lint.—The long fibre.

Loam.—A soil in which clay and sand mingle, neither predominating.

Retting, (rotting)—Incipient decay of the flax plant after pulling or cutting.

Retting Pool, (Rotting Pool) or Dam.—A pool with sodded bottom and sides, for retting flax under water.

Ridge.—The two furrow-slices turned together between lands; also the entire space between two dead furrows.

Rippling.—Removal of the bolls of flax with a comb.

Rotation of Crops.—A regular succession of different crops on the same land.

Rotting.—See retting.

Scutching.—Removal of the shove or shives by whipping with a blade called a swingle, or scutcher.

Shoove, Shove, Shive and Shives.—The woody or straw-like part of the flax haulm removed in breaking.

Soil.—Agriculturally, the earth turned by the plow or spade; in distinction from the sub soil, which see.

Stack.—A large quantity of hay, or of grain in the straw, laid up to stand the weather.

Steeping.—Soaking in water.

Stook, Shock.—A small number of sheaves or bundles arranged with system in the field, and standing on the buts.

Straw.—Applied to the haulm of flax, also to the woody portion.

Streek.—See "Hand."

Stubble. (Stubble land).—The land from which small grain has been cut.

Sub-Soil.—The earth below the soil which may be subjected to artificial drainage, or stirred by sub-soil plow.

Swingle.—See Scutching.

Tailings.—Light grain, etc., blown over with the chaff in winnowing.

Tow.—Broken, or tangled fibre.

Watering.—Water retting.

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